SPECIALIZED UNDERGRADUATE PILOT TRAINING: PRODUCING BETTER TRAINED PILOTS FOR AIR MOBILITY COMMAND

GRADUATE RESEARCH PAPER

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AFIT/GMO/LAL/96N-7

DEPARTMENT OF THE AIR FORCE
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Wright-Patterson Air Force Base, Ohio

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Maj Carl A. Lude

Table of Contents

List of Tables

Table Page

AFIT/GMO/LAL/96N-7

Abstract

Air Education and Training Command's acquisition of the T-1A marked the return to specialized undergraduate pilot training (SUPT), once used prior to 1959. Currently, three pilot training bases have completed the transition to the SUPT. All studies leading to SUPT cited cost and improved training quality as major factors in the decision to implement the SUPT concept. While cost figures can be analyzed at any time, the opportunity to evaluate differences between undergraduate pilot training (UPT) and SUPT based on instructor pilot expertise and experience is limited. This study examines the training quality improvements of SUPT as compared to UPT. It begins with an analysis of the two different training syllabi. It then examines two additional questionnaires to develop a unique survey targeted at drawing expert opinions about the differences in training quality of SUPT and UPT graduates. The results of this study verify the projected quality improvements of earlier studies and can be used as a benchmark for future improvements to the SUPT program. Future improvements include evaluating follow-on training and modifying this training to enhance both cost and training benefits of the new SUPT system. This study can provide the foundation necessary to target these future changes.

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I. Introduction

Background

A specialized undergraduate pilot training program (SUPT) is one which pursues a "tracking" or "specialized" approach to training. All student pilots receive a common primary training background and then enter an advanced training course tailored to the specific requirements of the two major types of aircraft: fighter/bomber and tanker/transport (10:Chp 5, 1). Currently, Air Education Training Command (AETC) is in the final stages of implementing the SUPT program. Three of the four training bases have fully integrated the T-1A while Columbus AFB is in the process of converting to SUPT. This is a unique time in pilot training history. Pilots are being trained through two distinct and separate training systems. Therefore, this is the perfect opportunity to draw comparisons and validate the foreseen training benefits.

A common expression, "What goes around, comes around," aptly describes the Air Force's decision to resurrect the concept of SUPT. Prior to 1959, the AF used variations of the SUPT concept with considerable success for 20 years, spanning both W.W.II and the Korean War (12:1; 13; 8:14-16). The return to SUPT has followed a long and winding path which began in 1964 when an Air University study, directed by HQ

USAF, raised the question of generalized versus specialized pilot training (12:11; 13). This sparked further studies which focused on a wide range of issues.

Several studies focused on airframe replacements for the T-37 and T-38 based on increased training projections. Many studies focused on cost savings. Others, such as Project FLYTE (Flying Training Evaluation), focused on how pilot training could be improved (12:11). In 1974, ATC Commander General John W. Roberts stated "the Air Force goal has been to produce a universally assignable pilot from Undergraduate Pilot Training (UPT); however, today's budgetary constraints may dictate that we change that policy. The logical result of such a policy change may be some type of a 'two-track' pilot training system" (12:12).

Shortly thereafter, Air Training Command (ATC, now Air Education and Training Command, AETC) proceeded with a study focused on identifying suitable aircraft for multi-engine training, the use of flight simulators, and the cost of specialized versus generalized training. Inputs from the MAJCOMs were mixed, although most commands felt SUPT had potential for cost savings and more importantly, for producing better quality pilots (12:13). Despite these findings, the study concluded that ATC acquisition flight simulators and retain the UPT system. The recommendation stated "Based upon study conclusions, specialized UPT would result in more economically trained graduates who are better prepared to fly follow-on aircraft. However, the purchase of new aircraft to support specialized training cannot be justified in view of today's austere budget, programmed low UPT production and the resulting aircraft fleet-

life extension this affords, and MAJCOM acceptance of the current, high quality UPT graduate" (10:Chp 10, 2).

General William V. McBride accepted the recommendation, but 6 months later asked General Roberts to explore every avenue for producing a better, more economically trained pilot (12:14). Two separate study groups were formed to evaluate pilot training. Both groups steered down the same path of specialized training and eventually merged into a single study. General Roberts concluded that "the only training system that can optimize both quality and cost is a specialized training system" (12:14). The continuing theme of a lower cost, better trained pilot, had not changed over the years of research and study. This time, however, there was the added pressure of an aging aircraft fleet. Both the T-37 and T-38 would need replacement by the year 2000 and the lead time necessary for aircraft acquisition added fuel to the SUPT spark.

Before initiating SUPT, Congress requested a masterplan outlining how the AF intended to proceed. This masterplan echoed the arguments for SUPT and paved the road for acquisition of the T-1A Jayhawk, the linchpin to implementation of SUPT. The plan concluded:

> While there are any number of ways the Air Force can train pilots, all approaches are not equal. They are not equal in the quality of training....Some produce a more qualified, better trained pilot than others. Nor are all approaches equal in their procurement and subsequent operating and support costs. Some are cheaper to acquire. Some are cheaper to operate. It is rare that one has the option of acquiring a system that is simultaneously best in all respects. Of all the options examined, SUPT promises to provide the highest quality graduates. SUPT is also the least costly training system to acquire and to operate. (12:26)

With this master plan, the acquisition of a tanker-transport training system was initiated and the contract was put up for bid. The Beechjet 400 (formerly the Mitsubishi Diamond) was later selected as the new trainer and designated the T-1A Jayhawk.

Problem Statement

The recurring themes of SUPT, from the revitalized concept sparked in the 1960s to implementation in 1993, center on cost and quality training. Cost savings have been realized, but the issue of improved pilot quality through SUPT has yet to be documented. This study attempts to validate the expected increase in training quality and provide a benchmark for quality initiatives for future improvements to the SUPT program. AMC's interest in the quality of SUPT pilot graduates is essential. The inputs from AMC provide necessary feedback to the provider, AETC. These inputs are vital to formulating the framework for SUPT curriculum development. Additional benefits include potential changes in follow-on Combat Crew Training School (CCTS) programs designed to integrate the SUPT system to optimize pilot training across the spectrum. If the T-1A graduates are better prepared for follow-on training, two possibilities exist. (1) Reduce the CCTS training time. (2) Improve training quality and raise performance standards accordingly throughout CCTS. A combination of these two paths would be optimum. Reducing the CCTS training time has cost benefits for AETC and can help training projections due to reduction in the training pipeline. Improving the quality of training throughout the system will produce more qualified and proficient pilots to AMC. This

may reduce the time necessary to bring new pilots up to mission ready status and may improve safety records in the future.

The focus of this research is to validate the training benefits of the T-1A specialized training program. This will be accomplished through answering several investigative questions. First, a comparison of the T-38 UPT syllabus and the T-1A SUPT syllabus will provide clues to potential training benefits. Second, an analysis of a survey conducted by Flight Safety on C-5 simulator performance of T-1A graduates will provide comparative information on the impact of SUPT verses UPT. This analysis is important because the simulator training is the immediate training step following SUPT. Third, an analysis of graduate evaluations filled out by both supervisors and graduates will add supportive evidence by identifying strengths and weaknesses in training areas. Finally, analysis of the three areas mentioned above will form the basis for a survey designed for the purpose of comparing the quality of T-38 graduates and T-1A graduates. Data from this survey will be analyzed to show statistical significance in quality improvement of identified training task areas.

Importance of Research

The Air Force Training Masterplan anticipated significant cost savings in several areas. The introduction of the new tanker-transport trainer was expected to save 40% in fuel costs over the T-38 and 25% in the number of maintenance man hours per flying hour. Additional savings would be realized by reduced flying demands on the T-38, allowing life extension of these airframes well into the 21st century. Former AETC

Commander General Viccellio, Jr. estimated the USAF saved more than $5 billion in acquisition and lifetime operating costs by procuring the T-1A training system instead of a T-38 replacement (11:42; 14).

One example of savings already documented is the Aviation, Petroleum, Oil, and Lubricants (AVPOL) savings. T-1A AVPOL cost is $198 per flying hour compared to $353 per flying hour for the T-38. Additionally, this figure is expected to decrease in the future as more data becomes available for cost analysis (7:7). In terms of real dollars, the 86th Flying Training Squadron saved more than $3.7 million in AVPOL costs in its first two years of operation (7:8; 15). As one of four primary units utilizing the T-1A, this savings is significant. Further projections for increased pilot training production will only increase the future AVPOL savings.

The second recurring theme of SUPT is quality of training. While cost figures are more readily available and easy to compare, the quality level of pilot training graduates is subjective and not readily available, making it difficult to draw comparisons to the former UPT program. Nonetheless, improved training quality was a main thrust for moving to specialized training and every effort should be made to validate these projections. Although cost comparisons have been performed, little has been done to demonstrate the effect of SUPT on the quality of pilot graduates. Studies on cost savings are easily quantifiable with definite boundaries while the impact on the training quality is difficult to determine. This study takes an exhaustive look at various indicators to help quantify the impact of any training quality improvements.

Furthermore, a study on the quality of graduates will not only validate previous SUPT projections, but may also serve as a benchmark for future improvements to the SUPT program. Feedback can provide more than guidance for syllabus modification and instructor inputs. The T-1A, with its glass cockpit design and computer technology, seems almost limitless on the training possibilities it can offer. This flexibility makes the T-1A an ideal platform for tailoring training to specific needs. The Feedback on how well SUPT graduates are prepared for their CCTS training is also key to future software changes in the T-1A cockpit and other software related program modifications.

The SUPT program reaches beyond the glass cockpit of the T-1A however. It represents a significant change in training philosophy. The T-1A training integrates crew resource management (CRM) throughout the program, concentrating on crew solutions to inflight situations. Additionally, the T-1A instructor force is a highly experienced cadre of pilots with large aircraft experience. This experience is key to unlocking the specialized training possibilities of the T-1A. Training pilots to think and respond to inflight situations as if they were in a large transport aircraft fosters the proper attitude and awareness to ease the transition to large aircraft.

This is a unique period in pilot training history. The opportunity exists to draw direct comparisons between T-38 and T-1A graduates. In less than a year, only T-1A graduates will enter tanker and transport training. Additionally, in a few short years, the CCTS instructors at Altus AFB will move on to new assignments. Their replacements will not have experience instructing both types of pilot graduates. When this occurs, it

will not be possible to make a direct comparison. This is the perfect time for an in-depth study on the training quality improvements of SUPT graduates. As AETC nears completion of the transition to the T-1A, the window of opportunity diminishes. Currently, Altus AFB is still receiving pilots from both UPT and SUPT. This is important for this study because it ensures that the opinions of the Altus AFB instructors on T-38 and T-1A graduates are current. Furthermore, because both T-38 and T-1A graduates are entering CCTS, effects of low pilot production and other issues which may affect training quality which are cyclical can be ignored because these cycles affect both systems simultaneously.

Selecting the Altus AFB instructors for the survey sample was a matter of expertise, history and conveience. The expert knowledge and first hand exposure of the graduate quality for both UPT and SUPT training systems among Altus AFB instructors makes them the perfect target for training improvement validation. As for convenience, although SUPT graduates receive follow-on training at other locations, the majority train at Altus AFB. Altus AFB offesr an unparalleled concentration of CCTS instructors with continuity through both types of undergraduate pilot training systems. Failure to take the opportunity to document quality differences at this juncture would be an injustice to the pilot training system.

II. Literature Review

Introduction

A quick look at the 1976 ATC study "Comparison of UPT Generalized vs. Specialized" gives great insight to the purpose of SUPT and a basis to compare the evolved program to the initial concept. Historically, follow-on UPT assignments have been split 35% FAR (Fighter Attack Reconnaissance) and 65% TTB (Tanker, Transport, Bomber) (10:Chp 6, 2). Although bomber pilots now follow the fighter track, fewer fighter assignments have more than offset these numbers. Previously, the generalized UPT system trained all pilots to be single seat fighter pilots. As a result, the majority of change required to implement the dual track pilot training system was in the area of transport pilot training. The 1976 study showed that specialized training would produce students better trained to meet the specific needs of the gaining commands. "The desired end results of SUPT are better operational pilots and reduced follow-on training costs for the MAJCOMs" (10:Chp 5, 1). At that time all follow-on CCTS training was provided by the gaining MAJCOM. Now that AETC runs most of the CCTS training, the potential for reduced follow-on training costs rests with AETC.

The 1976 study further specified that USAF pilot training should produce a first pilot qualified graduate rather than a co-pilot. This concept was fully backed by all MAJCOMs. The rationale behind this stemmed from the vastly different missions demands placed on the military co-pilot verses their civilian counterpart. Increased demands placed on the military co-pilot early in his/her flying career requires more

extensive basic pilot training. "While he may not perform first pilot duties, he frequently exercises skills, knowledge, judgment and techniques expected of first pilots" (10:Chp 7, 1). Airline candidates already possess commercial and instrument pilot licenses with varying amounts of flying time. Many have their Airline Transport Pilot (ATP) rating as well. These candidates are then hired as flight engineers with typical upgrade to co-pilot occurring after six years. Approximately another 10 years pass before upgrade to aircraft captain. In contrast, the military transport pilot, many of whom have little or no flying experience prior to the military, moves directly into the co-pilot position and often upgrades to aircraft commander within 3 years (10:Chp 7, 1). This relatively quick advancement highlights the need for the highest quality training possible.

The 1976 study was instrumental in selling the concept of SUPT. Finally, ATC began exhaustive efforts to implement the new training system. After several years of budget crunching and a congressionally mandated implementation plan, ATC proceeded with its new plan. The program included the concept of improved quality training throughout its development.

Syllabus Comparison

Comparison of the SUPT and UPT syllabi is critical to this research. SUPT is more than the acquisition of a new aircraft. SUPT is a complete training system philosophy which permeates all pilot training. In fact, implementation of the SUPT program drove many changes to the T-37 syllabus as well. Furthermore, success or failure of the tanker transport SUPT system rests on how well the syllabus and T-1A

instructor force exploit the potential of the T-1. The comparison of the T-38 and T-1A syllabi highlights major areas of change and provides clues to possible training improvements.

The concept of UPT centered around training a universally assignable pilot and therefore focused training towards flying a single seat fighter. Nearly 25% of the flying training accomplished was practically irrelevant to students selected to fly large aircraft. Advanced aerobatics, fingertip and tactical formation, along with numerous hours flown solo are examples of tasks inapplicable to flying large aircraft (7:11). The T-1A syllabus focuses training specifically towards skills required to fly large aircraft, thus maximizing the training dollar.

Table 1 compares critical portions of the T-1A SUPT syllabus to the T-38 UPT syllabus with regard to a tanker and transport type flying environment.

TABLE 1
SYLLABUS COMPARISON
PROGRAM TASK COMPARISON

Task	T-1A (SUPT)	T-38 (UPT)
Mission planning	Includes emphasis on weight and balance	No weight and balance
Enroute procedures	Includes severe weather avoidance using a weather radar	No weather radar
Low Altitude Approach	Full low altitude approaches emphasized	Not specified
Non-precision Approaches	VOR, NDB, BC LOC, TACAN, LOC, ASR,	TACAN, ASR, LOC
Landing	Teaches 1000 foot aimpoint (desired for large aircraft); X-wind - wing low method	Aimpoint short of over-run; X-wind - land in crab
Checklist Procedures	"Challenge and Response"	"Solo" approach
Autopilot Operation	Yes	No
Radar Operation	Yes	No
Flight Management System (FMS) Operation	Yes	No
Co-pilot Duties	Yes	No
Airdrop	Yes	No
Air Refueling	Yes	No
Formation Procedures	Emphasizes large aircraft formation procedures including cell and offset trail	Focuses on wingtip and tactical formation

(1:9-16; 2)

Table 1 identifies training areas that the T-1A SUPT system focuses on which are not emphasized or impossible to teach in the T-38 due to equipment limitations. Crew coordination is not listed even though it is a major difference in the two training philosophies. Interestingly enough, cockpit resource management (CRM), as it is called in the T-38 training program, is defined in precisely the same way that crew resource management (CRM) is defined in the T-1A syllabus. The major difference is the

emphasis placed on CRM throughout the training environment. In the T-1A, CRM is an integral part of every flight and is critical to mission success. The coordination of the crew through normal and emergency procedures is made routine through challenge and response checklist procedures. Furthermore, situational emergency procedures conducted in the classroom emphasize crew solutions to inflight situations. This type of crew concept atmosphere is absent from the T-38 training. So, despite identical definitions in the course training standards with regard to CRM, in reality, the T-1A pilots get far more practice exercising the many facets of CRM.

Another interesting comparison can be made between flight maneuver tolerances. The impact of these differences may not be as clear due to aircraft handling characteristics. For example, if the T-38 is more pitch sensitive, then a wider range of altitude tolerance for level flight may not necessarily indicate less positive aircraft control. On the other hand, strict flight maneuver tolerances taught early in a pilot's career can set the stage for what that pilot views as acceptable performance. As an example, a pilot trained to stricter tolerances accepts these tolerances as the norm. Any flight parameter exceeding these preconditioned limits would be viewed as unprofessional and a personal letdown. This argument presumes that pilots internalize flight tolerances learned early in their flying career and accept those as the norm. The following table highlights major differences in flight maneuver tolerances between the T-38 UPT and T-1A SUPT programs.

TABLE 2
SYLLABUS COMPARISON
FLIGHT MANEUVER TOLERANCE COMPARISON

Task	T-1A	T-38
Runway alignment during takeoff	+ or - 5 feet	+ or - 10 feet
Basic aircraft control altitude	+ or -100 feet	+ or - 200 feet
Basic aircraft control airspeed	+ or - 10 KIAS	+ or - 20 KIAS
Steep turns airspeed	+ or - 10 KIAS	+ or - 15 KIAS
ILS Approach	+ or - 1 dot width of glidepath	1 dot below or 2 dots above glidepath
Traffic pattern stalls airspeed	+ or - 10 KIAS	+ or - 15 KIAS

(1:9-16; 2)

This is not an attempt to show that T-1A pilots fly more precisely than T-38 pilots. As mentioned above, the skill required to maneuver the aircraft within the identified tolerances varies with the aircraft. In all cases the flight tolerances for the T-1A were equivalent to or more strict than the T-38 flight tolerances for the same maneuvers. Maneuvers not listed in Table 2 had identical tolerances listed. Overall, T-1A pilots are conditioned to more precise flight tolerances.

The T-1A offers several other potential advantages over the T-38. First, the ability to further specialize the training based on the students' follow-on flying assignments. Students selected to fly aircraft which perform airdrop, such as the C-17, get additional training in formation low level and simulated air drop. Other students receive additional training in air refueling. Procedures adopted for these advanced training tasks were extracted from operational directives of follow-on aircraft (C-141,

KC-135, KC-10). Second, the T-1A flight handling characteristics feel more like a large transport aircraft due to a specially designed flight control system. Third, the asymmetric thrust is a significant factor unlike the T-38. All engine out patterns and approaches are focused toward teaching the student proper management of asymmetric thrust. Although both the T-38 and T-1A syllabi specify single engine maneuvers, the asymmetric thrust of the T-1A provides a distinct training advantage. Finally, T-1A airspeeds throughout the mission are closer to those of follow-on aircraft. These syllabus changes and aircraft characteristics are designed to produce a pilot better prepared for large aircraft operations. What remains is to determine if the SUPT syllabus has met this goal.

Graduate Evaluation Questionnaire (Appendix M)

In an attempt to gain insight to customer satisfaction, AETC implemented the Aircrew Training Quality Evaluation and Customer Feedback Program (Grad/Eval) in December of 1994. The program provides AETC formal training schools with customer feedback for the purpose of assessing and improving training (3:2; 4:2). One part of this program consists of a questionnaire designed to assess critical tasks specific to aircraft and mission requirements. The questionnaire addresses 68 specific task areas in detail for a total of 76 questions.

Beginning with SUPT class 96-06, the grad/eval survey was modified. The reduction from 68 task related questions to 46 questions created difficulties in proper analysis. Therefore, only a one year period of grad/evals was examined in this study. Furthermore all grad/eval questionnaires reviewed for this study originated at Laughlin

AFB, TX. The survey was sent to Altus AFB and filled out by both the T-1A graduate and his/her primary CCTS instructor near the end of training at Altus AFB. Due to extremely low responses to questions 61 through 68, only the first 60 questions were evaluated. Table 3 summarizes the grading scale used in the grad/eval. For the purpose of this study, the N was disregarded yielding an ordinal scale of one through four, corresponding to U, M, S, E respectfully.

TABLE 3
GRADUATE EVALUATIONS
RATING SCALE

Not Performed	Unacceptable	Marginal	Satisfactory	Excellent
N	U	M	S	E

Although the grad/eval does provide feedback, difficulties getting the program started has limited its usefulness. At the Feb 96 Undergraduate Flying Training Review Conference at Randolph AFB, it was noted that the 55th Air Refueling Squadron (KC-135 training squadron at Altus AFB) had never seen an SUPT grad/eval form (6:5). Furthermore, return rates on the grad/evals has been mediocre at best. The quarterly report for the fourth quarter of fiscal 95 showed return rates of approximately 60%. Some units were only receiving a 23% return rate (5:3). At the time of data collection for this study, the return rate for the grad/evals was less than 50% preventing a comprehensive analysis of the grad/evals and introduced potential for selective biases (16).

Additionally, the grad/eval program does not compare the performance of T-1A graduates and T-38 graduates. Therefore, for the purpose of this study, the grad/eval only offers supportive evidence. No direct relation between UPT and SUPT can be drawn from the grad/eval surveys collected for this study. The possibility exists to compare grad/eval results from the T-38 UPT program to those compiled in this study. This would require data collection from Vance AFB through 1995 and all Columbus AFB grad/eval data to date.

The Grad/Eval surveys collected do offer a means of support for the findings of this study, and in the future, this study may assist in the quality improvement efforts of the Grad/Eval program. Individual AETC quality offices which track the grad/evals can use this study as a benchmark for their quality assessment and customer satisfaction reports.

Graduate Evaluation Analysis

The grad/eval survey was divided into supervisor responses and graduate responses. For the supervisors, the mean for all tasks exceeded satisfactory except steep turns and visual engine-out pattern and landing. This may not be a good indicator however, because of the limited number of responses received from both these questions. Only 4 supervisors responded to the question on steep turns and 7 responded to the engine-out pattern and landing. In each case, one of the responses reflected an unsatisfactory performance. Although we can recognize the unsatisfactory performance,

at this time, no conclusions can be drawn about the population due to the limited responses to these questions.

The mean score for each task was calculated and presented in the appendix J. Additionally, rank order of the mean response was calculated for all questions receiving more than 10 responses. The cutoff at 10 was selected to prevent biases of ranking data due to limited responses such as tasks 17 and 44 mentioned above. For tasks receiving more than 10 responses, the highest score was for CRM with a mean of 3.49 which is half way between the satisfactory and excellent ratings. Under the same conditions, autopilot operation scored the lowest with a mean of 3.10. The top ranked tasks by supervisors are summarized in the table below.

TABLE 4
GRADUATE EVALUATIONS
SUPERVISOR TASK RANKINGS

Rank	**Task**	**Mean**	**Rank**	**Task**	**Mean**
1	CRM	3.49	**7**	ASR Approach	3.39
2	Checklist Procedures	3.46	**8**	Inflight planning	3.38
3	Takeoff Procedures	3.44	**9**	AFM 51-37/AFI 11-206 Knowledge	3.38
4	Low Altitude Approach	3.42	**10**	Departure	3.38
5	ILS Approach	3.42	**11**	Flight log/DD 175 prep	3.38
6	Co-pilot duties	3.39	**12**	PAR Approach	3.38

These results support the SUPT syllabus. CRM, checklist procedures, and co-pilot duties were specific targets of SUPT program development. Additionally the increased emphasis on instrument flying shows up well in the supervisor responses. Low

altitude approach, ILS, PAR, ASR, and AFM 51-37 and AFI 11-206 knowledge reflect that supervisors appear to be very satisfied with the instrument training quality.

Overall, the graduate responses were more favorable compared to the supervisors responses (see appendix K). Table 5 summarizes the top ranked task areas as responded by the graduates.

TABLE 5
GRADUATE EVALUATIONS
GRADUATE TASK RANKINGS

Rank	**Task**	**Mean**	**Rank**	**Task**	**Mean**
1	Localizer approach	3.81	**7**	Takeoff	3.75
2	CRM	3.79	**8**	Departure	3.75
3	Low Altitude Approach	3.78	**9**	Mission planning	3.74
4	ILS Approach	3.78	**10**	Ground Operations	3.72
5	Checklist procedures	3.77	**11**	Co-pilot duties	3.71
6	VOR/TAC approach	3.76	**12**	Flight log/DD 175 prep	3.71

The similarity in rankings to the supervisor responses is evident. CRM, checklist procedures, co-pilot duties, and instrument related flying tasks all ranked well among the 60 tasks evaluated. An additional note for the graduate responses which is quite remarkable requires attention. All but three tasks had a mode of four, which corresponds to an excellent rating.

Direct Feedback

In November 1995, several members of the 86th Flying Training Squadron from Laughlin AFB went to Altus AFB to seek feedback on the SUPT program. Ten members of the 55th Air Refueling Squadron responded that SUPT graduates were "way ahead" of

everyone else entering their program. They added that they do not have to retrain the students for the correct aimpoint for landing (9:Attach 2, 1). Three instructors represented the 57th Airlift Squadron (C-141). All were very satisfied with T-1A graduates and commented that they were "leaps and bounds ahead" of the T-38 graduates (9:Attach 3, 1). The 56th Airlift Squadron (C-5) was represented by a single instructor who was very satisfied with the T-1A graduates (9:Attach 4, 1). These reports indicate an improvement in the quality of training received in the T-1A, but are still limited in scope. The comments are generalizations and represent a small number of instructors. While this anecdotal evidence supports the general concept of improved training through SUPT, it provides limited information for task related feedback.

Sweeney Survey (Appendix N)

One program that was implemented for the purpose of comparing SUPT and UPT occurred voluntarily. James V. Sweeney, Manager, Summative Evaluation for Flight Safety Services Corporation, Altus AFB authored a questionnaire designed to evaluate the major differences between SUPT and UPT graduates in C-5 simulator performance. His questionnaire informed the instructor that his/her student was an SUPT graduate and that the questionnaire was designed to assess the impacts of the SUPT training on the C-5 initial qualification course. The survey compared an actual T-1A graduate to the perceived T-38 standard. In most cases, the instructor compared a single T-1A graduate against the instructor's opinion of the typical T-38 graduate. However, when conditions permitted, a direct comparison was made between a T-1A graduate and a T-38 graduate.

This occurred when the initial C-5 qualification class was made up of a student pilot from each background.

The survey was broken down into 36 tasks. An additional section asked the instructor's opinion if the training could be accomplished with more, the same, or fewer simulator missions. The final area of the survey allows for comments to support the answers and give further insight to possible trends.

This survey is significant to this research for two reasons. (1) It directly compares T-1A and T-38 graduates. (2) It focuses on the immediate training following SUPT. There are some limitations, however, which restrict the transfer of knowledge gained from the survey to the T-1A program as a whole. Only a small portion of T-1A graduates move on to fly the C-5. The bulk of the T-1A graduates enter C-141 and KC-135 training. A comprehensive evaluation of the effectiveness of SUPT should include a cross-section of tanker and transport aircraft.

Although limited in scope, the survey offers two distinct advantages. (1) The data has been compiled since the first T-1A student arrived for C-5 training, facilitating an historical outlook. (2) The isolation of simulator performance which is the immediate follow-on training device after SUPT. This reduces any potential biases from other training received or time lag after SUPT.

Sweeney Analysis

The responses were scored 1, 2, and 3 corresponding to the -, 0, and + ratings listed on the survey. Both the mean and mode were calculated to show central tendency.

A t-test was performed using the null hypothesis that there is no difference between T-1A and T-38 graduates. This analysis identified any significant shift in the mean for each task area. A positive shift in the mean indicated a perceived improvement of the T-1 graduate over the T-38 graduate. Although there were only 20 questionnaires filled out, the entire population of C-5 simulator instructors were included. The questionnaires represent all 20 T-1A graduates that have entered C-5 training since the inception of SUPT (Sweeney Interview). Therefore, for the purpose for which this survey was designed, the entire population to date is included and the sample error is zero. The following two tables summarize the results by task and is ordered by ranking the p-value from low to high.

TABLE 6
SWEENEY SURVEY RESULTS
TASKS SIGNIFICANT AT 99% CONFIDENCE

Task	**Mean**	**Mode**	**Std Dev**	**P-Value**
FSAS/INS procedures	2.68	3	0.4776	0.0000
FSAS/INS	2.60	3	0.5026	0.0000
Crew Coordination	2.55	3	0.5104	0.0001
AFM 51-37	2.55	3	0.5104	0.0001
Autopilot Operation	2.45	2	0.5104	0.0004
Checklist Procedures	2.45	2	0.5104	0.0004
Aircraft Control	2.50	3	0.6070	0.0008
Radar Ops/Wx Avoid	2.40	2	0.5026	0.0010
Communication Procedures	2.40	2	0.5026	0.0010
Preflight	2.40	2	0.5026	0.0010
Takeoff Procedures	2.40	2	0.5026	0.0010
SID	2.40	2	0.5026	0.0010
Non-Precision App	2.45	3	0.6048	0.0018
Missed Approach/Go Around	2.35	2	0.5871	0.0076

TABLE 7
SWEENEY SURVEY RESULTS
TASKS SIGNIFICANT AT 95% CONFIDENCE

Taxi Procedures	2.28	2	0.4609	0.0102
Engine Out Landing/ Go Around	2.25	2	0.4443	0.0105
AFI 11-206	2.25	2	0.4443	0.0105
Precision App	2.3	2	0.5712	0.0149
Comm/Nav Equipment	2.3	2	0.5712	0.0149
Flight Planning	2.21	2	0.4189	0.0209
Dash One Usage	2.21	2	0.4189	0.0209
Safety Awareness	2.20	2	0.4104	0.0210
Holding	2.25	2	0.5501	0.0282
Judgment	2.25	2	0.5501	0.0282
Performance Data Concepts	2.25	2	0.5501	0.0282
Fuel Planning	2.16	2	0.3746	0.0414
Landing Gear EP	2.16	2	0.3746	0.0414
VFR Pattern/ Approach	2.15	2	0.3663	0.0414

TABLE 8
SWEENEY SURVEY RESULTS
TASKS FAILED AT 95% CONFIDENCE

Task	**Mean**	**Mode**	**Std Dev**	**P-Value**
Landing	2.21	2	0.5353	0.0518
Aircraft Systems	2.21	2	0.5353	0.0518
Instrumentation	2.20	2	0.5231	0.0518
CAT II ILS	2.11	2	0.3153	0.0814
Climb/Cruise/ Descent	2.16	2	0.5015	0.0934
Boldface Procedures	2.15	2	0.4894	0.0932
Other EP Checklist Procedures	2.15	2	0.4894	0.0932
Anti-Hijacking Procedures	2.00	2	0.0000	N/A

The results can also be summarized as shown in table 9.

TABLE 9
SWEENEY SURVEY RESULTS
SUMMARY

High Mean	**Mode of 3**	**Low Mean**	**Fail at 95% CI**
FSAS/INS operation	FSAS/INS operation Non-precision app Aircraft control Crew Coordination AFM 51-37	Anti-hijack CAT II ILS VFR patt/app Boldface Emergency checklist procedures	Anti-hijack CAT II ILS Climb/cruise/descent Boldface Emergency checklist procedures Aircraft systems Instrumentation Landing

The list of task areas that showed significant increase in quality at the 95% confidence level and above is overwhelming. Over 40% of the task areas surveyed showed improvement at the 99% confidence level. A major limitation to this analysis rests in the three point rating system which may affect the value of the results. What we can see from this study, however, is the beginnings of a pattern developing from task areas projected to improve through the syllabus analysis. As with the grad/evals, CRM and instrument related tasks scored well. In addition, we see the inclusion of FSAS/INS operation, autopilot operation and radar operation in the top scoring tasks. These results are in line with the syllabus comparison. Recall that table 1 identified FMS operation, which is similar in concept to FSAS/INS, autopilot operation, and radar operation as unique characteristics of the T-1 syllabus, unattainable in the T-38 program.

Summary

In 1964, the concept of SUPT was resurrected. Since then, many studies have been performed to validate the move to a specialized training system. Most notably were the 1976 study "Comparison of UPT Generalized vs. Specialized" and the inclusion of SUPT in the DOD Training Master Plan. Cost and quality of training were recurring themes echoed throughout studies spanning several decades. The system of specialized pilot training proposed to offer a rare combination of cost savings and improved training quality.

The SUPT system implementation began with the acquisition of the T-1A and the development of a new training syllabus. With these tools, it is believed that pilots are receiving better training, yet limited data exists to demonstrate the desired results. Grad/eval surveys were introduced to assist in feedback throughout the training system. The grad/eval program, however, does not target differences between the previous UPT system and the new SUPT training system. Additionally, the grad/eval program has received less than optimum participation. Another attempt for feedback on the SUPT program included a direct feedback session between the 86 Flying Training Squadron and units at Altus AFB. This meeting showed favorable responses for the SUPT program but was limited in scope by the number of instructors who attended the meetings and the generalization their responses. The Sweeney survey is the only study which has focused on direct comparison of UPT graduates and SUPT graduates. Although an excellent vehicle for its intended use of identifying potential areas of impact for the C-5 Initial

Qualification Course, the results alone are insufficient to project across the entire T-1A SUPT graduate population.

The survey generated for this research was inspired by all of the above. The study focuses on the training quality improvements and hopes to verify projected benefits of SUPT. Furthermore, this study can be used as a benchmark for future improvements in the SUPT training system and our future AMC pilot force.

III. Method

Overview

Three different areas were researched to aid in the development of the a general opinion survey and to provide clues towards areas of improvement in the SUPT program. First, a comparative study of the T-38 UPT syllabus and the T-1A SUPT syllabus provided clues to potential areas of improvement. The comparison looked at tasks instructed as well as flight tolerances required. Second, evaluation of the Sweeney survey combined with syllabus reviews of each of the follow-on aircraft provided great insight towards identifying task areas to focus the research. The third area of focus was the analysis of student graduation evaluations (grad/eval) filled out by both the SUPT student after arrival at Altus AFB and his/her assigned CCTS (Combat Crew Training School) instructor.

This led to the development of a general opinion survey of instructors at Altus AFB, herein referred to as the Lude survey. The survey was specifically designed for this study and focuses solely on T-1A initial qualification graduates. The survey (appendix C) focused on capturing the general opinions of CCTS instructors on the quality of T-1A graduates compared to T-38 graduates on a task-specific basis. It relies solely on the instructors' experience and knowledge of both T-1A graduates and T-38 graduates to generate a task by task comparison of UPT versus SUPT.

Both USAF flight line and civilian contract simulator instructors at Altus AFB were surveyed. Participants were selected based on their experience and ability to draw

meaningful relationships between the two groups of pilots. The experience base at Altus AFB ensured that all survey participants were highly qualified instructors in their aircraft. In addition, survey participants had to have instructed both T-1A and T-38 pilot graduates. Altus AFB was chosen because this is where the preponderance of T-1A graduates accomplish their follow-on training. T-1A graduates selected to fly aircraft other than the C-5, C-141, and KC-135 were not considered in this survey.

The survey consisted of 34 task-specific questions. Additionally, there were four questions designed to identify potential savings capability for specific training media. Finally, the last two questions were designed to help identify weaknesses in either the T-38 or T-1A programs and included ample room for comments. The bulk of the survey generated ordinal data on a scale from one to five. An answer of three indicated that the instructor witnessed no difference between T-38 graduates and T-1A graduates for the identified task. Answers of four or five indicated the instructor believed T-1A graduates performed "better" and "significantly better" than T-38 graduates for that task, while answers of one and two indicated "significantly worse" and "worse," respectively.

This survey in concert with support analysis from the three areas previously studied should provide significant insight to the quality improvement of SUPT training. The remaining portion of this chapter describes the methodology in detail for the Lude survey.

Hypothesis Formulation

The survey designates the value three as the "no difference" mean. This allows the assumption that if there were no perceived difference in quality, the mean response would be three. Thus the null hypothesis for the analysis was "there is no difference between T-1A pilot graduates and T-38 pilot graduates."

Statistical Analysis

For statistical comparisons and significance testing, the value three was used as the population mean. The population standard deviation was approximated with the sample standard deviation for the identified task. Calculated z-scores showed statistical significance of any shift in the mean for the conglomerate data. One-tailed tests were used to show the level of quality *improvement* of the SUPT program.

Further subdivision of the data by aircraft type and simulator provided a more detailed look at the impact of T-1A training. Each of the three follow-on aircraft studied has markedly different training programs. It would be no surprise to have areas of noticeable improvement in one aircraft with no improvement in another due to the training syllabus of that particular aircraft. An example would be air refueling. This is an area trained extensively in the KC-135 but not addressed in C-141 initial co-pilot training. The breakdown of the Lude survey results by aircraft allowed this type of analysis, increasing the level of understanding on the quality impact of SUPT.

Due to the low sample numbers after subdividing the data, however, greater sampling error would normally be expected. The sample error in this case is not

significant and did not present significant problems with regard to the methodology. Although only 8 C-5 instructors filled out the survey, less than 15 instructors were qualified to participate. Thus, the sample in this case was more than half the population. For this reason, it was believed that the information collected by individual aircraft type would be helpful in identifying trends.

Potential Biases

There are several opportunities for bias in the Lude survey. The first potential bias stems from the surveying of flight line instructors. The information gathered from the flying instructors has the potential of being biased by the simulator instruction received at Altus. Although this is true, it would appear to have the same impact on T-38 and T-1A graduates alike. The simulator instruction could be a filter or magnifier of the SUPT training. The most likely effect is as a filter. The filter theory recognizes that although differences in previous training are apparent, the simulator instruction received is identical and the standards to progress to the next level (flight training) is identical. Essentially, the simulator would tend to smooth out any previous training differences. The converse may also be true. If the T-1A graduate is better prepared to receive the multi-engine simulator instruction, perhaps a magnifying effect takes place. This would be true under the theory that if a pilot is better prepared, he/she can learn faster and learn more than one who is not as well prepared for the training, even though the instruction received is identical. An overarching analysis of the survey results, however, would minimize this bias as both simulator and flight line instructors were polled.

A second bias that is possible with the Lude survey stems from human nature. All survey participants were graduates of the T-38 pilot training program. An instructor who states that T-1A graduates are better prepared than T-38 graduates is admitting that T-1A graduates are better pilots than they were when they graduated years ago. This may be a fascinating topic for psychologists who study the pilot ego. I recognize this potential bias as it was brought to mind during my research by a survey participant, however, it is not believed to have a significant impact on the results.

IV. Results

Complete tabulation of the survey results are located in appendix zz. The mean score on every task exceeded the value three suggesting a sweeping perceived quality improvement across the board. The calculated z-scores show a significant positive shift in the mean in all but five tasks to the 99% confidence level and in all but one task to the 95% confidence level. The following table lists the overall totals for all tasks combined and allows comparison of overall results between aircraft type.

TABLE 10
LUDE SURVEY RESULTS
TOTAL RATING RESPONSES

Rating	KC-135 Totals	C-141 Totals	C-5 Totals	C-5 Sim Totals	C-141 Sim Totals	Combined Totals
1	0	0	0	0	0	0
2	5	5	6	6	5	27
3	287	173	200	283	324	1267
4	232	113	52	43	59	499
5	58	7	3	2	10	80

The highest mean for a task was 3.877 for crew coordination while the lowest was 3.105 for VFR pattern/approach. The VFR pattern/approach was the only task that did not show a significant positive shift in the mean at the 95% confidence level. Additionally, CAT II ILS, dash one usage, AFI 11-206 knowledge, and knowledge of General Planning (GP) showed no significant positive shift at the 99% confidence level. For all tasks, the mode was three or four. A mode equal to four corresponded to the following tasks: autopilot operation, radar operation/weather avoidance, use and

understanding of FSAS/INS, and crew coordination. From this the following table can be constructed.

TABLE 11
LUDE SURVEY RESULTS
COMPOSITE SUMMARY

High mean	Mode of 4	Low mean	Fail at 95% CI
crew coordination	crew coordination autopilot operation radar ops/wx avoid FSAS/INS	VFR patt/app	VFR patt/app

A similar analysis for each aircraft and simulator yields the following tables for comparison.

TABLE 12
LUDE SURVEY RESULTS
KC-135 SUMMARY

High mean	Mode of 4	Low mean	Fail at 95% CI
crew coordination	A/R and rendez proc* crew coordination preflight takeoff procedures autopilot operation FSAS/INS basic aircraft control holding precision approach normal landing crosswind landing checklist procedures radio communications situational awareness	AFI 11-206	ICAO proc CAT II ILS VFR patt/app AFM 51-37 AFI 11-206

* Mode = 5

TABLE 13
LUDE SURVEY RESULTS
C-141 SUMMARY

High mean	**Mode of 4**	**Low mean**	**Fail at 95% CI**
crew coordination FSAS/INS Proc cross Wind Landing	crew coordination takeoff procedures autopilot operation FSAS/INS basic aircraft control precision approach crosswind landing checklist procedures judgment situational awareness	CAT II ILS VFR patt/app boldface proc performance data concepts dash one use GP	CAT II ILS VFR patt/app boldface proc performance data concepts dash one use GP fuel planning flight planning aircraft control holding night operation aircraft systems situational awareness radio comm AFM 51-37 AFI 11-206

TABLE 14
LUDE SURVEY RESULTS
C-5 SUMMARY

High mean	**Mode of 4**	**Low mean**	**Pass at 95% CI**
autopilot operation	autopilot operation radar ops/wx avoid	takeoff proc	autopilot operation radar ops/wx avoid CAT II ILS normal landing crosswind landing

TABLE 15
LUDE SURVEY RESULTS
C-5 SIMULATOR SUMMARY

High mean	Mode of 4	Low mean	Pass at 95% CI
FSAS/INS operation	radar ops/wx avoid FSAS/INS operation	takeoff proc performance data concepts	autopilot operation radar ops/wx avoid FSAS/INS operation asymmetric thrust

TABLE 16
LUDE SURVEY RESULTS
C-141 SIMULATOR SUMMARY

High mean	Mode of 4	Low mean	Pass at 95% CI
crew coordination	radar ops/wx avoid FSAS/INS operation	fuel planning VFR patt/app missed app/GA night operation radio comm situational awareness judgment dash one use AFI 11-206	autopilot operation radar ops/wx avoid FSAS/INS operation precision app crosswind landing checklist procedure crew coordination performance data concepts

A ranking table has also been constructed to show the top ten ranked tasks. This table compares the top ten rankings of each aircraft and the overall rankings. Ties in the rankings are noted in parenthesis.

TABLE 17
LUDE SURVEY RESULTS
TOP TEN RANKED TASKS

Rank	All	KC-135	C-5	C-141
1	Crew coord	Crew coord	Autopilot operation	Crew coord (1)
2	FSAS/INS	FSAS/INS (2)	Radar ops/wx avoid	Crosswind landings (1)
3	Autopilot operation	Air refueling and rendezvous (2)	CAT II ILS	FSAS/INS (1)
4	Radar ops/wx avoid	Checklist procedures	Air refueling and rendezvous	Autopilot operation (4)
5	Precision approach	Radio communications	Normal landing (5)	Radar ops/wx avoid (4)
6	Checklist procedures	Autopilot operation	Crosswind landings (5)	Asymmetric thrust
7	Asymmetric thrust	Basic aircraft control	Asymmetric thrust (7)	Takeoff procedures (7)
8	Crosswind landings	Situational awareness	Emergency checklist proc (7)	SID (7)
9	Air refueling and rendezvous	Crosswind landings	*	Precision approach (7)
10	Normal landing	Normal Landing (10)	*	Emergency checklist proc (7)
		Preflight (10)		Checklist procedures (7)
				Judgment (7)

* Nine tasks tied in ranking for ninth. They are flight planning, FSAS/INS, precision approach, non-precision approach, night operations, radio communications, crew coordination, AFM 51-37, and AFI 11-206 knowledge.

V. Discussion

The study shows statistically significant quality improvement in all tasks surveyed except VFR pattern and landing. The results are not surprising based on program projections and the syllabus comparison, though the scope of increased quality in pilot training is overwhelming. The results demonstrate beyond reasonable doubt what many T-1A and MWS instructors have been saying all along. SUPT has produced pilots that are better prepared for follow-on training than the previous UPT training system.

In most cases, the results of the study were well supported by the syllabus comparison, grad/eval, 86 FTS feedback meetings, and the Sweeney survey. The differences are few and most can be explained.

To start with, all top 10 tasks in the study are supported by the SUPT syllabus. All but one of these tasks are unique tasks to the T-1A over the T-38. While the precision approach is common to both training methods it ranks fifth in overall improvement among training tasks. The reasons for this is probably a combination of several factors although any attempt to explain the difference is speculation. Is it the increased instrument time in the syllabus or the stricter flight tolerances for precision approaches? Most likely it is a combination of these factors and others which have not been identified.

Additional tasks areas that did not rank as high as expected based on SUPT syllabus include non-precision approaches and ICAO procedures. Although not ranked very high, these task areas did show improved training quality. Comparisons made are relative to other improved task areas. The T-1A syllabus concentrates a significant

amount of time to low altitude and non-precision approach work. VOR, NDB, and BC LOC are approaches flown in the T-1A which are not possible in the T-38 due to equipment. Additionally, the SUPT syllabus includes ample instruction on ICAO procedures. The T-1A students fly a substantial number of these approaches off-station to enhance training. Although improvement has been perceived, it may not be proportional to the added syllabus time and equipment that the T-1A offers over the T-38. To exemplify this, consider that boldface procedures ranked about the same as ICAO procedures. Both the T-38 and T-1A programs concentrate equally on boldface emergency procedures, while only the T-1A offers instruction on ICAO instrument procedures. This may indicate that the ICAO training in the T-1A is not paying off as well as expected. On the other hand, overall instrument procedures scored well in both the grad/evals and the Sweeney survey.

So how do the results of the other questionnaires compare to this study? The following table compares the relative ranking of the top responses of this study to the Sweeney survey rankings and grad/eval mean scores.

TABLE 18
SURVEY COMPARISON
RANKING COMPARISON

Task	Lude Rank	Sweeney Rank	Grad/eval Mean Supervisor/Graduate
Crew Coordination	1	3	3.49/3.79
FSAS/INS procedures	2	2	N/A
autopilot	3	5	3.10/3.58
radar ops/wx avoid	4	8	3.19/3.35
precision app	5	18	ILS - 3.42/3.78 PAR - 3.38/3.55
checklist procedures	6	5	3.46/3.77
asymmetric thrust	7	16	3.16/3.56 *
crosswind landing	8	N/A	N/A
A/R and rendezvous proc	9	N/A	3.40/3.68 *
normal landing	10	29	3.24/3.62

* Averages of all sub-categories for that task

The table shows consistent results with regard to the top ranked tasks. There are three tasks ranked in the top ten of the Lude survey that did not rank as well in the Sweeney survey. The most notable difference is in the normal landing. For many reasons the landing training in the T-1A should produce a significant improvement over a T-38 graduate. The aimpoint, wing low crosswind techniques, and airspeeds on final more closely resemble that of large aircraft. This study suggests significant improvement in this area as expected by the syllabus. Normal landing in the Sweeney survey, however, just missed showing improvement over the T-38 training at the 95% confidence level. Understanding that the Sweeney survey evaluated simulator performance, which is generally not the best training device for landing, leads one to assume that the differences here are minor. Although both supervisors and graduates scored pattern and landing above satisfactory, the relative ranking with other tasks suggests that there may be room

for improvement. The supervisors' overall rating is just slightly above satisfactory. This is not overly supportive evidence to support this study. Also notice that the grad/eval survey lists four different types of landings other than engine out landings. The landing task area listed in table 18 for comparison was the transition to landing/landing.

Based on the SUPT syllabus and program definition, asymmetric thrust was expected to show marked improvement. The improved quality of asymmetric thrust training was significant for the justification specialized training. In this study, asymmetric thrust showed significant improvement beyond the 99% confidence level while the Sweeney survey showed significance at the 95% confidence level. Statistically these numbers support this study's findings although the responses were not as convincing from the Sweeney survey. The grad/eval results are favorable but not overwhelming in the area of asymmetric thrust.

Precision approach also stands out. The differences here are not as drastic as they appear, however. The grad/evals with average scores between satisfactory and excellent offer strong support for the results of this study. The major difference is in the rankings between the Sweeney survey and this study. Once again, however, referring to the Sweeney results, it is clear that the precision approach task showed significant improvement at the 95% confidence level. So even though it did not receive a similar high ranking among other tasks, it does support this study in that a significant improvement has been perceived.

This study produced highly satisfying confirmation of anticipated SUPT training improvements. Simply put, a significant quality improvement in the USAF pilot training has occurred through the T-1A program. Initial qualification pilots entering training at Altus AFB are better trained and better prepared to meet their follow-on training challenges. Observations made herein are for the purpose of identifying areas of potential improvements to the SUPT program and to show which training events have had the greatest impact on the SUPT graduate.

The only task which did not show a significant quality improvement was VFR pattern and approach. Perhaps this is a tradeoff for all the instrument work in the syllabus. Nonetheless, there is room for improvement. The VFR pattern for a T-38 is drastically different from a large aircraft. Faster speeds, quicker maneuverability, greater bank angles and G forces are examples of the major differences. Because the T-1A flies similar speeds and bank angles to the larger aircraft, it appears there is no reason this task area should not show significant improvement.

Referring to table 17, several notable points can be made. The tasks perceived to have had the greatest impact on training at Altus are crew coordination, checklist procedures, air refueling and rendezvous procedures, autopilot operation, radar operation and weather avoidance, FSAS/INS use, asymmetric thrust, and cross wind landings. Crew coordination was a recurring theme in grad/eval comments. "The T-1A program was outstanding for CRM, AFM 51-37, and AFI 11-206. I was way ahead of T-38 students at the start. I could not ask for better preparation than the T-1A program."

(3A:18). This is perhaps the greatest contribution from the SUPT program, not only because it scored the highest, but because of the interrelationships with all other tasks performed inflight. It is the basis for crew resource management (CRM) and impacts all aspects of flying and executing the mission. Synergy from good crew coordination can create a better flying atmosphere in the cockpit. From a safety viewpoint, crew coordination is a common thread in a majority of large aircraft accidents. Such an overwhelming response in this area reflects great credit on the T-1A program.

Some tasks are aircraft-specific such as air refueling and rendezvous which is instructed in the KC-135 but not in the C-141. This affects the overall scores and rankings, yet with limited instructors responding to the air refueling task it easily scored in the top ten. Another aircraft-specific task is the radar operation and weather avoidance. In the KC-135 this is a primary function of the navigator and therefor not considered in the co-pilot training. Nevertheless, radar operations scored very high.

There was noticeable disagreement among different aircraft with regard to takeoff procedures. The C-5 instructors in both the simulator and aircraft consistently scored takeoff procedures low. The primary cause for this was noted in almost all cases due to the hand position of the pilot throughout the takeoff maneuver. T-1A pilots are trained to take their hands off the throttles at decision speed, while C-5 training mandates that you leave the hands on the throttles until safely airborne. This same comment was voiced by a graduate in the grad/eval. Further investigation shows that the C-141 training is in line

with the C-5 training. This raises a significant question for the T-1A training approach for takeoffs.

Finally the issue of aircraft control. Basic aircraft control has been an unknown side effect of the T-1A as a training platform. Many believers in the generalized pilot training approach predicted that aircraft control may suffer in a specialized training approach. Their argument was that the T-38 would develop pilots with better aircraft control because of the precision formation flying and precise handling required. This study contradicts these beliefs. Basic aircraft control scored well in all three surveys. Perhaps this can be attributed to the large aircraft feel of the T-1A or the stricter flight tolerances which students are trained.

VI. Summary and Conclusion

Summary

According to several studies prior to the implementation of the program, SUPT was expected to produce better quality pilots for a reduced cost. This study represents the report card for the quality of SUPT training by evaluating its effects as viewed by the expert instructors at Altus AFB. The study shows that SUPT has done a marvelous job preparing young pilots for follow-on training. Statistical significance was shown in 36 out of 37 task areas studied, demonstrating widespread quality improvement of SUPT graduates over generalized UPT. Results were well supported by unique syllabus differences in addition to two independent surveys and a plethora of comments contained in the surveys, grad/evals, and verbalized by line instructors at Altus AFB.

This study was subdivided by aircraft and analyzed by task. This allowed identification of tasks which effect the greatest impact on follow-on training by aircraft type. A discussion covering relative improvements of training areas maybe used to further fine tune the SUPT program. Additionally, insights gained on the effectiveness of SUPT can help training managers focus future changes in other training programs which surround SUPT.

Conclusion: Accomplishing the SUPT Goal

"The desired end results of SUPT are better operational pilots and reduced follow-on training costs." (10:Chp 5, 1). Providing better trained pilots is precisely what SUPT has accomplished, but the goal reaches a bit farther. The goal is a better operational pilot,

which includes CCTS training. SUPT allows greater flexibility within AETC to manage training events throughout the complete training cycle. The AF no longer has to wait until CCTS training to teach realistic asymmetric thrust procedures and techniques, nor air refueling procedures. These are examples of task areas which allow greater flexibility within the training system by allowing the training to occur in a smaller, less expensive aircraft. The next critical step in the realization of the SUPT goal, therefore, is managing these training events throughout the system to maximize training benefits at reduced costs.

Certainly, any reduction in follow-on MWS training can only be realized by demonstrated performance of SUPT graduates. This study has conclusively shown that SUPT graduates have been better prepared for follow-on training, and possible reductions in CCTS programs are indeed possible. Further, introduction of mission oriented flying skills into undergraduate training have proven effective. Training in air refueling is one example which has already paid big dividends in follow-on training. Adequate air refueling training received in the T-1A should allow a reduction in air refueling training events required in MWS training.

Increased training capability via SUPT has surfaced a peculiar problem, however. The standardization among MWS training programs. The 55th ARS graduates a mission-qualified pilot while the 57th AS and the 56th AS graduate a basic-qualification pilot. This difference in training philosophies, to some degree, explains the higher ratings in the KC-135 instructor responses. In other words, the pre-existing structure of the KC-135

training program has taken better advantage of the SUPT product. Standardizing end of training expectations across aircraft type can further enhance the effects of SUPT by allowing more training events to be managed throughout the entire system. Should CCTS prepare a mission-qualified pilot or a basic-qualification pilot? Does the demonstrated capabilities of SUPT change the way the AF addresses this question? What about SUPT program projections which included the goal of graduating a first pilot instead of a co-pilot? The 1976 study indicated the need to graduate a first pilot not a copilot. Is this possible now with SUPT? Does AMC still want a first pilot?

Certainly, knowing the capabilities of the SUPT program is critical to establishing attainable goals. Resolving questions such as these and standardizing the vision of an MWS pilot graduate are key to unleashing the future power of SUPT. Diverse expectations of MWS pilot graduates, defeats the purpose and potential benefits of SUPT.

This study has produced the necessary foundation to move forward with the total SUPT concept. The T-1A has proven itself as a superb training platform, but SUPT does not end with the T-1A. SUPT has many advantages over previous training systems. Capitalizing on these advantages is this next step in the SUPT process. A system-wide training review including the quality improvements reported by this study would be an excellent place to start.

Appendix A: Lude Survey Combined Data Analysis

Average Experience as MWS Instructor = 4.7 Years

		Question										
Response	**Totals**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	0	0	0	0	0	0	0	0	0	0	0	0
2	27	0	0	0	5	1	0	1	0	3	0	0
3	1267	40	39	35	32	41	21	23	21	27	20	41
4	499	8	13	17	20	14	27	23	25	23	11	15
5	80	0	0	2	0	1	7	5	11	1	8	1
	Count	48	52	54	57	57	56	53	57	55	39	57
	Max	4	4	5	4	5	5	5	5	5	5	5
	Min	3	3	3	2	2	3	2	3	2	3	3
	Mode	3	3	3	3	3	4	4	4	3	3	3
	Mean	3.1667	3.2500	3.3889	3.2632	3.2632	3.7411	3.6132	3.8246	3.4091	3.6923	3.2982
	Std Dev	0.3766	0.4372	0.5636	0.6131	0.5185	0.6674	0.6839	0.7349	0.6243	0.7998	0.4987
	z-calc	3.0659	4.1231	5.0708	3.2404	3.8321	8.3098	6.5277	8.4708	4.8598	5.4057	4.5147
1-tail	95% interval	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450
1-tail	99% interval	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300
Significance	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Significance	99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Rank	24	19	11	23	21	3	4	2	12	9	13
	P-Value	0.0011	0	0	0.0006	0	0	0	0	0	0	0

Appendix A: Lude Survey Combined Data Analysis (continued)

Average Experience as MWS Instructor = 4.7 Years

Response	Question 11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	1	1	2	4	1	0	1	0	0	0	0	0
3	41	32	37	44	32	44	44	37	31	49	41	33	50	45
4	15	23	16	8	9	8	12	18	20	8	13	20	7	12
5	1	2	3	1	0	1	0	1	5	0	2	1	0	0
Count	57	57	57	54	43	57	57	57	57	57	56	54	57	57
Max	5	5	5	5	4	5	4	5	5	4	5	5	4	4
Min	3	3	2	2	2	2	2	3	2	3	3	3	3	3
Mode	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean	3.2982	3.4737	3.3684	3.1667	3.1628	3.1053	3.1930	3.3596	3.5088	3.1404	3.3036	3.4074	3.1228	3.2105
Std Dev	0.4987	0.5703	0.6162	0.4658	0.4845	0.5239	0.4407	0.5154	0.6846	0.3504	0.5366	0.5327	0.3311	0.4113
z-calc	4.5147	6.2713	4.5140	2.6293	2.2031	1.5170	3.3059	5.2681	5.6108	3.0237	4.2332	5.6206	2.8000	3.8644
95% interval	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450
99% Interval	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300
95%	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rank	13	5	14	29	33	34	22	10	8	25	18	7	28	20
P-Value	0	0	0	0.0043	0.0189	0.0643	0.0005	0	0	0.0013	0	0	0.0025	0

Appendix A: Lude Survey Combined Data Analysis (continued)

Average Experience as MWS Instructor = 4.7 Years

Response	Question 25	26	27	28	29	30	31	32	33	34	35	36	37
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	2	1	1	0	2	0	1	0	0	0	0	0
3	31	35	17	38	43	43	52	46	52	51	0	0	0
4	20	16	27	15	14	11	5	10	5	5	1	1	1
5	6	4	12	3	0	1	0	0	0	0	2	0	0
Count	57	57	57	57	57	57	57	57	57	56	3	1	1
Max	5	5	5	5	4	5	4	4	4	4	5	4	4
Min	3	2	2	2	3	2	3	2	3	3	4	4	4
Mode	3	3	4	3	3	3	3	3	3	3	5	N/A	N/A
Mean	3.5614	3.3860	3.8772	3.3509	3.2456	3.1930	3.0877	3.1579	3.0877	3.0893	4.6667	4.0000	4.0000
Std Dev	0.6818	0.6749	0.7576	0.6121	0.4343	0.5154	0.2854	0.4136	0.2854	0.2877	0.5774	N/A	N/A
z-calc	6.2162	4.3175	8.7418	4.3277	4.2700	2.8268	2.3205	2.8823	2.3205	2.3221	5.0000	N/A	N/A
95% interval	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450	1.6450
99% Interval	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300	2.3300
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A
99%	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	N/A	N/A
Rank	6	16	1	15	17	27	31	26	31	30			
P-Value	0	0	0	0	0	0.0023	0.0102	0.0020	0.0102	0.0102	0		

Appendix B: Lude Survey KC-135 Data Analysis

Average Experience as CCTS Instructor = 2.3 Years

Response	Totals	Question 1	2	3	4	5	6	7	8	9	10	11
1	0	0	0	0	0	0	0	0	0	0	0	0
2	5	0	0	0	0	0	0	1	0	1	0	0
3	287	12	10	7	7	13	4	6	1	2	3	8
4	232	6	8	9	11	4	11	5	11	14	7	9
5	58	0	0	2	0	1	3	3	6	1	8	1
	Count	18	18	18	18	18	18	15	18	18	18	18
	Max	4	4	5	4	5	5	5	5	5	5	5
	Min	3	3	3	3	3	3	2	3	2	3	3
	Mode	3	3	4	4	3	4	3	4	4	5	4
	Mean	3.3333	3.4444	3.7222	3.6111	3.3333	3.9444	3.6667	4.2778	3.8333	4.2778	3.6111
	Std Dev	0.4851	0.5113	0.6691	0.5016	0.5941	0.6391	0.8997	0.5745	0.6183	0.7519	0.6077
	t-calc	2.9155	3.6878	4.5794	5.1686	2.3805	6.2693	2.8697	9.4361	5.7177	7.2099	4.2666
	t-test	0.9952	0.9991	0.9999	1.0000	0.9854	1.0000	0.9938	1.0000	1.0000	1.0000	0.9997
	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	99%	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
	P-value	0.0048	0.0009	0.0001	0.0000	0.0146	0.0000	0.0062	0.0000	0.0000	0.0000	0.0003
	Rank	24	20	10	14	24	6	13	2	7	2	14

Appendix B: Lude Survey KC-135 Data Analysis (continued)

Average Experience as CCTS Instructor = 2.3 Years

	Question												
Response	12	13	14	15	16	17	18	19	20	21	22	23	24
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	0	0	1	0	0	0	0	0
3	6	9	15	4	13	11	6	5	14	11	8	14	10
4	11	8	1	1	3	7	11	9	4	5	8	3	7
5	1	1	0	0	1	0	1	3	0	1	1	0	0
Count	18	18	16	5	18	18	18	18	18	17	17	17	17
Max	5	5	4	4	5	4	5	5	4	5	5	4	4
Min	3	3	3	3	2	3	3	2	3	3	3	3	3
Mode	4	3	3	3	3	3	4	4	3	3	3	3	3
Mean	3.7222	3.5556	3.0625	3.2000	3.2222	3.3889	3.7222	3.7778	3.2222	3.4118	3.5882	3.1765	3.4118
Std Dev	0.5745	0.6157	0.2500	0.4472	0.6468	0.5016	0.5745	0.8085	0.4278	0.6183	0.6183	0.3930	0.5073
t-calc	5.3334	3.8282	1.0000	1.0000	1.4577	3.2891	5.3334	4.0817	2.2039	2.7456	3.9223	1.8516	3.3466
t-test	1.0000	0.9993	0.8334	0.8130	0.9184	0.9978	1.0000	0.9996	0.9792	0.9928	0.9994	0.9587	0.9980
95%	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
P-value	0.0000	0.0007	0.1666	0.1870	0.0816	0.0022	0.0000	0.0004	0.0208	0.0072	0.0006	0.0413	0.0020
Rank	10	17	33	29	27	23	10	9	27	21	16	30	21

Appendix B: Lude Survey KC-135 Data Analysis (continued)

Average Experience as CCTS Instructor = 2.3 Years

Response	Question 25	26	27	28	29	30	31	32	33	34	35	36	37
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0	0	0	0
3	2	2	0	6	9	10	13	15	16	15	0	0	0
4	9	10	9	8	8	6	4	2	1	2	0	0	0
5	6	4	8	3	0	1	0	0	0	0	2	0	0
Count	17	17	17	17	17	17	17	17	17	17	2	0	0
Max	5	5	5	5	4	5	4	4	4	4	5	0	0
Min	3	2	4	3	3	3	3	3	3	3	5	0	0
Mode	4	4	4	4	3	3	3	3	3	3	5		
Mean	4.2353	4.0000	4.4706	3.8235	3.4706	3.4706	3.2353	3.1176	3.0588	3.1176	5.0000		
Std Dev	0.6642	0.7906	0.5145	0.7276	0.5145	0.6243	0.4372	0.3321	0.2425	0.3321	0.0000		
t-calc	7.6681	5.2154	11.7851	4.6667	3.7712	3.1081	2.2188	1.4606	1.0000	1.4606			
t-test	1.0000	1.0000	1.0000	0.9999	0.9992	0.9966	0.9793	0.9183	0.8339	0.9183			
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No			
99%	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No			
P-value	0.0000	0.0000	0.0000	0.0001	0.0008	0.0034	0.0207	0.0817	0.1661	0.0817			
Rank	4	5	1	8	18	18	26	31	34	31			

Appendix C: Lude Survey C-141 Data Analysis

Average Experience as Altus Instructor = 1.8 Years

		Question										
Totals	**Response**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
0	1	0	0	0	0	0	0	0	0	0	0	0
5	2	0	0	0	0	0	0	0	0	1	0	0
173	3	6	7	5	4	4	3	3	3	2	4	7
113	4	1	1	4	5	5	5	5	4	5	2	2
7	5	0	0	0	0	0	1	1	2	0	0	0
	Count	7	8	9	9	9	9	9	9	8	6	9
	Max	4	4	4	4	4	5	5	5	4	4	4
	Min	3	3	3	3	3	3	3	3	2	3	3
	Mode	3	3	3	4	4	4	4	4	4	3	3
	Mean	3.1429	3.1250	3.4444	3.5556	3.5556	3.7778	3.7778	3.8889	3.5000	3.3333	3.2222
	Std Dev	0.3780	0.3536	0.5270	0.5270	0.5270	0.6667	0.6667	0.7817	0.7559	0.5164	0.4410
	t-calc	1.0000	1.0000	2.5298	3.1623	3.1623	3.5000	3.5000	3.4112	1.8708	1.5811	1.5119
	t-test	0.8220	0.8247	0.9824	0.9933	0.9933	0.9960	0.9960	0.9954	0.9482	0.9127	0.9155
	95%	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
	99%	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No
	P-value	0.1780	0.1753	0.0176	0.0067	0.0067	0.0040	0.0040	0.0046	0.0518	0.0873	0.0845
	Rank	27	28	14	7	7	4	4	1	13	18	21

Appendix C: Lude Survey C-141 Data Analysis (continued)

Average Experience as Altus Instructor = 1.8 Years

	Question												
Response	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	1	0	0	0	0	0	0	0	0
3	4	5	5	6	6	6	6	3	7	4	2	8	7
4	5	4	4	2	2	3	3	4	2	5	5	1	2
5	0	0	0	0	0	0	0	2	0	0	0	0	0
Count	9	9	9	9	9	9	9	9	9	9	7	9	9
Max	4	4	4	4	4	4	4	5	4	4	4	4	4
Min	3	3	3	2	2	3	3	3	3	3	3	3	3
Mode	4	3	3	3	3	3	3	4	3	4	4	3	3
Mean	3.5556	3.4444	3.4444	3.1111	3.1111	3.3333	3.3333	3.8889	3.2222	3.5556	3.7143	3.1111	3.2222
Std Dev	0.5270	0.5270	0.5270	0.6009	0.6009	0.5000	0.5000	0.7817	0.4410	0.5270	0.4880	0.3333	0.4410
t-calc	3.1623	2.5298	2.5298	0.5547	0.5547	2.0000	2.0000	3.4112	1.5119	3.1623	3.8730	1.0000	1.5119
t-test	0.9933	0.9824	0.9824	0.7029	0.7029	0.9597	0.9597	0.9954	0.9155	0.9933	0.9959	0.8267	0.9155
95%	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No
99%	Yes	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No
P-value	0.0067	0.0176	0.0176	0.2971	0.2971	0.0403	0.0403	0.0046	0.0845	0.0067	0.0041	0.1733	0.0845
Rank	7	14	14	29	29	18	18	1	21	7	6	29	21

Appendix C: Lude Survey C-141 Data Analysis (continued)

Average Experience as Altus Instructor = 1.8 Years

	Question												
Response	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	0	1	0	0	0	0	0	0	0
3	4	7	2	3	4	6	8	7	7	8	0	0	0
4	5	2	6	5	5	2	1	2	2	1	1	1	1
5	0	0	1	0	0	0	0	0	0	0	0	0	0
Count	9	9	9	9	9	9	9	9	9	9	1	1	1
Max	4	4	5	4	4	4	4	4	4	4	4	4	4
Min	3	3	3	2	3	2	3	3	3	3	4	4	4
Mode	4	3	4	4	4	3	3	3	3	3			
Mean	3.5556	3.2222	3.8889	3.4444	3.5556	3.1111	3.1111	3.2222	3.2222	3.1111	4.0000	4.0000	4.0000
Std Dev	0.5270	0.4410	0.6009	0.7265	0.5270	0.6009	0.3333	0.4410	0.4410	0.3333			
t-calc	3.1623	1.5119	4.4376	1.8353	3.1623	0.5547	1.0000	1.5119	1.5119	1.0000			
t-test	0.9933	0.9155	0.9989	0.9481	0.9933	0.7029	0.8267	0.9155	0.9155	0.8267			
95%	Yes	No	Yes	No	Yes	No	No	No	No	No			
99%	Yes	No	Yes	No	Yes	No	No	No	No	No			
P-value	0.0067	0.0845	0.0011	0.0519	0.0067	0.2971	0.1733	0.0845	0.0845	0.1733			
Rank	7	21	1	14	7	29	29	21	21	29			

Appendix D: Lude Survey C-5 Data Analysis

Average Experience as Altus Instructor = 1.4 Years

		Question										
Totals	**Response**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
0	1	0	0	0	0	0	0	0	0	0	0	0
6	2	0	0	0	2	0	0	0	0	1	0	0
200	3	4	6	7	5	7	3	4	6	5	3	7
52	4	1	2	1	1	1	4	4	2	2	2	1
3	5	0	0	0	0	0	0	0	0	0	0	0
	Count	5	8	8	8	8	7	8	8	8	5	8
	Max	4	4	4	4	4	4	4	4	4	4	4
	Min	3	3	3	2	3	3	3	3	2	3	3
	Mode	3	3	3	3	3	4	4	3	3	3	3
	Mean	3.2000	3.2500	3.1250	2.8750	3.1250	3.5714	3.5000	3.2500	3.1250	3.4000	3.1250
	Std Dev	0.4472	0.4629	0.3536	0.6409	0.3536	0.5345	0.5345	0.4629	0.6409	0.5477	0.3536
	t-calc	1.0000	1.5275	1.0000	0.5517	1.0000	2.8284	2.6458	1.5275	0.5517	1.6330	1.0000
	t-test	0.8130	0.9148	0.8247	0.7008	0.8247	0.9850	0.9834	0.9148	0.7008	0.9111	0.8247
	95%	No	No	No	No	No	Yes	Yes	No	No	No	No
	99%	No	No	No	No	No	No	No	No	No	No	No
	P-value	0.1870	0.0852	0.1753	0.2992	0.1753	0.0150	0.0166	0.0852	0.2992	0.0889	0.1753
	Rank	18	9	20	34	20	1	2	9	20	4	20

Appendix D: Lude Survey C-5 Data Analysis (continued)

Average Experience as Altus Instructor = 1.4 Years

	Question												
Response	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	2	1	0	0	0	0	0	0	0
3	7	7	7	4	4	5	5	5	6	6	5	7	7
4	0	0	1	3	2	2	3	3	2	0	2	1	1
5	1	1	0	0	0	0	0	0	0	1	0	0	0
Count	8	8	8	7	8	8	8	8	8	7	7	8	8
Max	5	5	4	4	4	4	4	4	4	5	4	4	4
Min	3	3	3	3	2	2	3	3	3	3	3	3	3
Mode	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean	3.2500	3.2500	3.1250	3.4286	3.0000	3.1250	3.3750	3.3750	3.2500	3.2857	3.2857	3.1250	3.1250
Std Dev	0.7071	0.7071	0.3536	0.5345	0.7559	0.6409	0.5175	0.5175	0.4629	0.7559	0.4880	0.3536	0.3536
t-calc	1.0000	1.0000	1.0000	2.1213	0.0000	0.5517	2.0494	2.0494	1.5275	1.0000	1.5492	1.0000	1.0000
t-test	0.8247	0.8247	0.8247	0.9609	0.5000	0.7008	0.9602	0.9602	0.9148	0.8220	0.9138	0.8247	0.8247
95%	No	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No
99%	No	No	No	No	No	No	No	No	No	No	No	No	No
P-value	0.1753	0.1753	0.1753	0.0391	0.5000	0.2992	0.0398	0.0398	0.0852	0.1780	0.0862	0.1753	0.1753
Rank	9	9	20	3	30	20	5	5	9	7	7	20	20

Average Experience as Altus Instructor = 1.4 Years

Response	Question 25	26	27	28	29	30	31	32	33	34	35	36	37
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	7	6	6	8	7	8	8	6	6	6	0	0	0
4	1	2	2	0	1	0	0	2	2	1	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0
Count	8	8	8	8	8	8	8	8	8	7	0	0	0
Max	4	4	4	3	4	3	3	4	4	4	0	0	0
Min	3	3	3	3	3	3	3	3	3	3	0	0	0
Mode	3	3	3	3	3	3	3	3	3	3			
Mean	3.1250	3.2500	3.2500	3.0000	3.1250	3.0000	3.0000	3.2500	3.2500	3.1429			
Std Dev	0.3536	0.4629	0.4629	0.0000	0.3536	0.0000	0.0000	0.4629	0.4629	0.3780			
t-calc	1.0000	1.5275	1.5275	N/A	1.0000	N/A	N/A	1.5275	1.5275	1.0000			
t-test	0.8247	0.9148	0.9148	N/A	0.8247	N/A	N/A	0.9148	0.9148	0.8220			
95%	No	No	No	N/A	No	N/A	N/A	No	No	No			
99%	No	No	No	N/A	No	N/A	N/A	No	No	No			
P-value	0.1753	0.0852	0.0852	N/A	0.1753	N/A	N/A	0.0852	0.0852	0.1780			
Rank	20	9	9	30	20	30	30	9	9	19			

Appendix E: Lude Survey C-5 Simulator Data Analysis

Average Experience as Altus Instructor = 10.8 Years

Totals	Response	Question 1	2	3	4	5	6	7	8	9	10	11
0	1	0	0	0	0	0	0	0	0	0	0	0
6	2	0	0	0	2	0	0	0	0	0	0	0
283	3	10	9	8	7	9	5	5	4	8	5	9
43	4	0	1	2	1	1	5	5	5	1	0	1
2	5	0	0	0	0	0	0	0	1	0	0	0
	Count	10	10	10	10	10	10	10	10	9	5	10
	Max	3	4	4	4	4	4	4	5	4	3	4
	Min	3	3	3	2	3	3	3	3	3	3	3
	Mode	3	3	3	3	3	3	4	4	3	3	3
	Mean	3.0000	3.1000	3.2000	2.9000	3.1000	3.5000	3.5000	3.7000	3.1111	3.0000	3.1000
	Std Dev	0.0000	0.3162	0.4216	0.5676	0.3162	0.5270	0.5270	0.6749	0.3333	0.0000	0.3162
	t-calc	N/A	1.0000	1.5000	0.5571	1.0000	3.0000	3.0000	3.2796	1.0000	N/A	1.0000
	t-test	N/A	0.8283	0.9161	0.7045	0.8283	0.9925	0.9925	0.9952	0.8267	N/A	0.8283
	95%	N/A	No	No	No	No	Yes	Yes	Yes	No	N/A	No
	99%	N/A	No	No	No	No	Yes	Yes	Yes	No	N/A	No
	P-value	N/A	0.1717	0.0839	0.2955	0.1717	0.0075	0.0075	0.0048	0.1733	N/A	0.1717

Average Experience as Altus Instructor = 10.8 Years

Response	Question 12	13	14	15	16	17	18	19	20	21	22	23	24
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	9	8	10	9	9	10	10	9	10	9	7	10	9
4	1	2	0	1	1	0	0	1	0	1	3	0	1
5	0	0	0	0	0	0	0	0	0	0	0	0	0
Count	10	10	10	10	10	10	10	10	10	10	10	10	10
Max	4	4	3	4	4	3	3	4	3	4	4	3	4
Min	3	3	3	3	3	3	3	3	3	3	3	3	3
Mode	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean	3.1000	3.2000	3.0000	3.1000	3.1000	3.0000	3.0000	3.1000	3.0000	3.1000	3.3000	3.0000	3.1000
Std Dev	0.3162	0.4216	0.0000	0.3162	0.3162	0.0000	0.0000	0.3162	0.0000	0.3162	0.4830	0.0000	0.3162
t-calc	1.0000	1.5000	N/A	1.0000	1.0000	N/A	N/A	1.0000	N/A	1.0000	1.9640	N/A	1.0000
t-test	0.8283	0.9161	N/A	0.8283	0.8283	N/A	N/A	0.8283	N/A	0.8283	0.9594	N/A	0.8283
95%	No	No	N/A	No	No	N/A	N/A	No	N/A	No	Yes	N/A	No
99%	No	No	N/A	No	No	N/A	N/A	No	N/A	No	No	N/A	No
P-value	0.1717	0.0839	N/A	0.1717	0.1717	N/A	N/A	0.1717	N/A	0.1717	0.0406	N/A	0.1717

Appendix E: Lude Survey C-5 Simulator Data Analysis (continued)

Average Experience as Altus Instructor = 10.8 Years

	Question												
Response	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	1	0	0	1	0	1	0	0	0	0	0
3	9	7	5	8	10	9	10	7	10	10	0	0	0
4	1	2	3	2	0	0	0	2	0	0	0	0	0
5	0	0	1	0	0	0	0	0	0	0	0	0	0
Count	10	10	10	10	10	10	10	10	10	10	0	0	0
Max	4	4	5	4	3	3	3	4	3	3	0	0	0
Min	3	2	2	3	3	2	3	2	3	3	0	0	0
Mode	3	3	3	3	3	3	3	3	3	3			
Mean	3.1000	3.1000	3.4000	3.2000	3.0000	2.9000	3.0000	3.1000	3.0000	3.0000			
Std Dev	0.3162	0.5676	0.8433	0.4216	0.0000	0.3162	0.0000	0.5676	0.0000	0.0000			
t-calc	1.0000	0.5571	1.5000	1.5000	N/A	1.0000	N/A	0.5571	N/A	N/A			
t-test	0.8283	0.7045	0.9161	0.9161	N/A	0.8283	N/A	0.7045	N/A	N/A			
95%	No	No	No	No	N/A	No	N/A	No	N/A	N/A			
99%	No	No	No	No	N/A	No	N/A	No	N/A	N/A			
P-value	0.1717	0.2955	0.0839	0.0839	N/A	0.1717	N/A	0.2955	N/A	N/A			

Appendix F: Lude Survey C-141 Simulator Data Analysis

Average Experience as Altus Instructor = 9.0 Years

		Question										
Totals	**Response**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
0	1	0	0	0	0	0	0	0	0	0	0	0
5	2	0	0	0	1	1	0	0	0	0	0	0
324	3	8	7	8	9	8	6	5	7	10	5	10
59	4	0	1	1	2	3	2	4	3	1	0	2
10	5	0	0	0	0	0	3	1	2	0	0	0
	Count	8	8	9	12	12	12	11	12	12	5	12
	Max	3	4	4	4	4	5	5	5	4	3	4
	Min	3	3	3	2	2	3	3	3	3	3	3
	Mode	3	3	3	3	3	3	3	3	3	3	3
	Mean	3.0000	3.1250	3.1111	3.0833	3.1667	3.7083	3.5909	3.5833	3.1250	3.0000	3.1667
	Std Dev	0.0000	0.3536	0.3333	0.5149	0.5774	0.8649	0.6640	0.7930	0.3108	0.0000	0.3892
	t-calc	N/A	1.0000	1.0000	0.5606	1.0000	2.8369	2.9515	2.5483	1.3933	N/A	1.4832
	t-test	N/A	0.8247	0.8267	0.7069	0.8306	0.9919	0.9928	0.9865	0.9045	N/A	0.9170
	95%	N/A	No	No	No	No	Yes	Yes	Yes	No	N/A	No
	99%	N/A	No	No	No	No	Yes	Yes	No	No	N/A	No
	P-value	N/A	0.1753	0.1733	0.2931	0.1694	0.0081	0.0072	0.0135	0.0955	N/A	0.0830

Appendix F: Lude Survey C-141 Simulator Data Analysis (continued)

Average Experience as Altus Instructor = 9.0 Years

	Question												
Response	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	1	1	0	0	0	0	0	0	0	0	0
3	6	8	7	9	12	12	10	9	12	11	11	11	12
4	6	2	2	2	0	0	1	3	0	2	2	2	1
5	0	1	1	0	0	0	0	0	0	0	0	0	0
Count	12	12	11	12	12	12	12	12	12	13	13	13	13
Max	4	5	5	4	3	3	4	4	3	4	4	4	4
Min	3	2	2	2	3	3	3	3	3	3	3	3	3
Mode	4	3	3	3	3	3	3	3	3	3	3	3	3
Mean	3.5000	3.2500	3.2727	3.0833	3.0000	3.0000	3.1250	3.2500	3.0000	3.1538	3.1538	3.1538	3.0769
Std Dev	0.5222	0.7538	0.7862	0.5149	0.0000	0.0000	0.3108	0.4523	0.0000	0.3755	0.3755	0.3755	0.2774
t-calc	3.3166	1.1489	1.1504	0.5606	N/A	N/A	1.3933	1.9149	N/A	1.4771	1.4771	1.4771	1.0000
t-test	0.9966	0.8625	0.8616	0.7069	N/A	N/A	0.9045	0.9591	N/A	0.9173	0.9173	0.9173	0.8315
95%	Yes	No	No	No	N/A	N/A	No	Yes	N/A	No	No	No	No
99%	Yes	No	No	No	N/A	N/A	No	No	N/A	No	No	No	No
P-value	0.0034	0.1375	0.1384	0.2931	N/A	N/A	0.0955	0.0409	N/A	0.0827	0.0827	0.0827	0.1685

Appendix F: Lude Survey C-141 Simulator Data Analysis (continued)

Average Experience as Altus Instructor = 9.0 Years

Response	Question 25	26	27	28	29	30	31	32	33	34	35	36	37
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	9	13	4	13	13	10	13	11	13	12	0	0	0
4	4	0	7	0	0	3	0	2	0	1	0	0	0
5	0	0	2	0	0	0	0	0	0	0	0	0	0
Count	13	13	13	13	13	13	13	13	13	13	0	0	0
Max	4	3	5	3	3	4	3	4	3	4	0	0	0
Min	3	3	3	3	3	3	3	3	3	3	0	0	0
Mode	3	3	4	3	3	3	3	3	3	3			
Mean	3.3077	3.0000	3.8462	3.0000	3.0000	3.2308	3.0000	3.1538	3.0000	3.0769			
Std Dev	0.4804	0.0000	0.6887	0.0000	0.0000	0.4385	0.0000	0.3755	0.0000	0.2774			
t-calc	2.3094	N/A	4.4296	N/A	N/A	1.8974	N/A	1.4771	N/A	1.0000			
t-test	0.9802	N/A	0.9996	N/A	N/A	0.9590	N/A	0.9173	N/A	0.8315			
95%	Yes	N/A	Yes	N/A	N/A	Yes	N/A	No	N/A	No			
99%	No	N/A	Yes	N/A	N/A	No	N/A	No	N/A	No			
P-value	0.0198	N/A	0.0004	N/A	N/A	0.0410	N/A	0.0827	N/A	0.1685			

Appendix G: Lude Survey Data t-score Comparison

t-scores

Question	KC-135	C-141	C-141 Sim	C-5	C-5 Sim
1	2.9155	1.0000	N/A	1.0000	N/A
2	3.6878	1.0000	1.0000	1.5275	1.0000
3	4.5794	2.52982	1.0000	1.0000	1.5000
4	5.1686	3.16228	0.5606	0.5517	0.5571
5	2.3805	3.16228	1.0000	1.0000	1.0000
6	6.2693	3.5000	2.8369	2.8284	3.0000
7	2.8697	3.5000	2.9515	2.6458	3.0000
8	9.4361	3.41121	2.5483	1.5275	3.2796
9	5.7177	1.87083	1.3933	0.5517	1.0000
10	7.2099	1.5811	N/A	1.633	N/A
11	4.2666	1.5119	1.4832	1.0000	1.0000
12	5.3334	3.1623	3.3166	1.0000	1.0000
13	3.8282	2.5298	1.1489	1.0000	1.5000
14	1.0000	2.5298	1.1504	1.0000	N/A
15	1.0000	0.5547	0.5606	2.1213	1.0000
16	1.4577	0.5547	N/A	0	1.0000
17	3.2891	2.0000	N/A	0.5517	N/A
18	5.3334	2.0000	1.3933	2.0494	N/A
19	4.0817	3.4112	1.9149	2.0494	1.0000
20	2.2039	1.5119	N/A	1.5275	N/A
21	2.7456	3.1623	1.4771	1.0000	1.0000
22	3.9223	3.8730	1.4771	1.5492	1.9640
23	1.8516	1.0000	1.4771	1.0000	N/A
24	3.3466	1.51186	1.0000	1.0000	1.0000
25	7.6681	3.1623	2.3094	1.0000	1.0000
26	5.2154	1.5119	N/A	1.5275	0.5571
27	11.785	4.4376	4.4296	1.5275	1.5000
28	4.6667	1.8353	N/A	N/A	1.5000
29	3.7712	3.1623	N/A	1.0000	N/A
30	3.1081	0.5547	1.8974	N/A	1.0000
31	2.2188	1.0000	N/A	N/A	N/A
32	1.4606	1.5119	1.4771	1.5275	0.5571
33	1.0000	1.5119	N/A	1.5275	N/A
34	1.4606	1.0000	1.0000	1.0000	N/A

Appendix H: Lude Survey Data Ranking Comparison

	Ranking				
Question	KC-135	C-141	C-141 Sim	C-5	C-5 Sim
1	22	31	N/A	15	N/A
2	18	27	18	8	10
3	12	13	18	15	5
4	10	7	23	28	21
5	25	7	22	15	10
6	5	3	4	1	2
7	23	3	3	2	2
8	2	5	5	8	1
9	6	18	14	28	9
10	4	20	N/A	6	N/A
11	13	21	9	15	10
12	7	7	2	15	10
13	16	13	17	15	5
14	32	13	16	15	N/A
15	32	32	23	3	10
16	31	32	N/A	31	10
17	20	16	N/A	28	N/A
18	7	16	14	4	N/A
19	14	5	7	4	10
20	27	21	N/A	8	N/A
21	24	7	10	26	10
22	15	2	10	7	4
23	28	27	10	15	N/A
24	19	21	18	15	10
25	3	7	6	15	10
26	9	21	N/A	8	21
27	1	1	1	8	5
28	11	19	N/A	N/A	5
29	17	7	N/A	15	N/A
30	21	32	8	N/A	10
31	26	27	N/A	N/A	N/A
32	29	21	10	8	21
33	34	21	N/A	8	N/A
34	29	27	18	27	N/A

Appendix I: Sweeney Survey Data

	Question										
Response	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3	3	4	8	5	8	8	4	9	8	13	6
2	16	15	12	13	12	12	14	11	12	6	13
1	0	0	0	0	0	0	1	0	0	0	1
Count	19	19	20	18	20	20	19	20	20	19	20
Mode	2	2	2	2	2	2	2	2	2	3	2
Mean	2.1579	2.2105	2.4000	2.2778	2.4000	2.4000	2.1579	2.4500	2.4000	2.6842	2.2500
Std Dev	0.3746	0.4189	0.5026	0.4609	0.5026	0.5026	0.5015	0.5104	0.5026	0.4776	0.5501
t-calc	1.8371	2.1909	3.5590	2.5570	3.5590	3.5590	1.3725	3.9428	3.5590	6.2450	2.0323
t-test	0.9586	0.9791	0.9990	0.9898	0.9990	0.9990	0.9066	0.9996	0.9990	1.0000	0.9718
95%	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
99%	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No
P-value	0.0414	0.0209	0.0010	0.0102	0.0010	0.0010	0.0934	0.0004	0.0010	0.0000	0.0282
Rank	26	20	8	15	8	8	33	5	8	1	23

Appendix I: Sweeney Survey Data (continued)

	Question												
Response	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
3	7	10	2	3	5	8	11	5	7	5	12	4	4
2	12	9	17	17	13	11	8	13	12	14	8	15	15
1	1	1	0	0	1	1	1	1	1	1	0	1	1
Count	20	20	19	20	19	20	20	19	20.	20	20	20	20
Mode	2	3	2	2	2	2	3	2	2	2	3	2	2
Mean	2.3000	2.4500	2.1053	2.1500	2.2105	2.3500	2.5000	2.2105	2.3000	2.2000	2.6000	2.1500	2.1500
Std Dev	0.5712	0.6048	0.3153	0.3663	0.5353	0.5871	0.6070	0.5353	0.5712	0.5231	0.5026	0.4894	0.4894
t-calc	2.3486	3.3275	1.4552	1.8311	1.7143	2.6659	3.6839	1.7143	2.3486	1.7097	5.3385	1.3708	1.3708
t-test	0.9851	0.9982	0.9186	0.9586	0.9482	0.9924	0.9992	0.9482	0.9851	0.9482	1.0000	0.9068	0.9068
95%	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No
99%	No	Yes	No	No	No	Yes	Yes	No	No	No	Yes	No	No
P-value	0.0149	0.0018	0.0814	0.0414	0.0518	0.0076	0.0008	0.0518	0.0149	0.0518	0.0000	0.0932	0.0932
Rank	18	13	32	28	29	14	7	29	18	31	2	34	34

Appendix I: Sweeney Survey Data (continued)

	Question												
Response	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
3	5	3	9	8	11	4	6	0	6	4	11	5	1
2	15	16	11	12	9	16	13	16	13	15	9	15	0
1	0	0	0	0	0	0	1	0	1	0	0	0	0
Count	20	19	20	20	20	20	20	16	20	19	20	20	1
Mode	2	2	2	2	3	2	2	2	2	2	3	2	3
Mean	2.2500	2.1579	2.4500	2.4000	2.5500	2.2000	2.2500	2.0000	2.2500	2.2105	2.5500	2.2500	
Std Dev	0.4443	0.3746	0.5104	0.5026	0.5104	0.4104	0.5501	0.0000	0.5501	0.4189	0.5104	0.4443	
t-calc	2.5166	1.8371	3.9428	3.5590	4.8189	2.1794	2.0323	N/A	2.0323	2.1909	4.8189	2.5166	
t-test	0.9895	0.9586	0.9996	0.9990	0.9999	0.9790	0.9718	N/A	0.9718	0.9791	0.9999	0.9895	
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	
99%	No	No	Yes	Yes	Yes	No	No	N/A	No	No	Yes	No	
P-value	0.0105	0.0414	0.0004	0.0010	0.0001	0.0210	0.0282	N/A	0.0282	0.0209	0.0001	0.0105	
Rank	16	26	5	8	3	22	23	N/A	23	20	3	16	

Appendix J: Graduate Evaluation Supervisor Responses

		Question												
Totals	**Response**	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
11	2	0	0	0	0	0	1	1	0	1	0	0	0	2
738	3	22	18	22	19	21	17	24	19	19	18	24	21	22
373	4	12	11	13	15	13	15	9	16	11	17	9	13	5
	Count	34	29	35	34	34	34	34	35	31	35	33	34	29
	Mode	3	3	3	3	3	3	3	3	3	3	3	3	3
	Mean	3.3529	3.3793	3.3714	3.4412	3.3824	3.3529	3.2353	3.4571	3.3226	3.4857	3.2727	3.3824	3.1034
	Std Dev	0.4851	0.4938	0.4902	0.5040	0.4933	0.6912	0.4960	0.5054	0.5408	0.5071	0.4523	0.4933	0.4888
	t-calc	4.2426	4.1366	4.4823	5.1042	4.5198	2.9775	2.7663	5.3508	3.3211	5.6667	3.4641	4.5198	1.1397
	t-test	0.9999	0.9999	1.0000	1.0000	1.0000	0.9973	0.9954	1.0000	0.9988	1.0000	0.9992	1.0000	0.8680
	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	P-value	0.0001	0.0001	0.0000	0.0000	0.0000	0.0027	0.0046	0.0000	0.0012	0.0000	0.0008	0.0000	0.1320
	Rank	15	11	13	3	8	15	29	2	18	1	24	8	38

Appendix J: Graduate Evaluation Supervisor Responses (continued)

	Questiion													
Response	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	1	0	0	0	0	0	0
3	13	20	21	2	2	1	19	19	9	19	19	19	10	14
4	3	13	13	1	2	2	8	9	3	5	14	14	6	9
Count	16	33	34	4	4	3	27	29	12	24	33	33	16	23
Mode	3	3	3	3	4	4	3	3	3	3	3	3	3	3
Mean	3.1875	3.3939	3.3824	2.7500	3.5000	3.6667	3.2963	3.2759	3.2500	3.2083	3.4242	3.4242	3.3750	3.3913
Std Dev	0.4031	0.4962	0.4933	1.2583	0.5774	0.5774	0.4653	0.5276	0.4523	0.4149	0.5019	0.5019	0.5000	0.4990
t-calc	1.8605	4.5607	4.5198	-0.3974	1.7321	2.0000	3.3087	2.8159	1.9149	2.4602	4.8558	4.8558	3.0000	3.7607
t-test	0.9587	1.0000	1.0000	N/A	0.9092	0.9082	0.9986	0.9956	0.9591	0.9891	1.0000	1.0000	0.9955	0.9995
95%	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	No	Yes	Yes	N/A	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
P-value	0.0413	0.0000	0.0000	N/A	0.0908	0.0918	0.0014	0.0044	0.0409	0.0109	0.0000	0.0000	0.0045	0.0005
Rank	36	6	8				22	23	28	35	4	4	12	7

Appendix J: Graduate Evaluation Supervisor Responses (continued)

Response	Question 28	29	30	31	32	33	34	35	36	37	38	39	40
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	1	0	1	0	0
3	6	21	17	19	21	20	3	3	21	3	24	22	21
4	3	12	3	9	10	7	1	1	8	1	9	8	11
Count	9	33	20	28	31	27	4	4	30	4	34	30	32
Mode	3	3	3	3	3	3	3	3	3	3	3	3	3
Mean	3.3333	3.3636	3.1500	3.3214	3.3226	3.2593	3.2500	3.2500	3.2333	3.2500	3.2353	3.2667	3.3438
Std Dev	0.5000	0.4885	0.3663	0.4756	0.4752	0.4466	0.5000	0.5000	0.5040	0.5000	0.4960	0.4498	0.4826
t-calc	2.0000	4.2762	1.8311	3.5762	3.7796	3.0166	1.0000	1.0000	2.5357	1.0000	2.7663	3.2474	4.0297
t-test	0.9597	0.9999	0.9586	0.9993	0.9997	0.9972	0.8045	0.8045	0.9916	0.8045	0.9954	0.9985	0.9998
95%	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes
99%	No	Yes	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes
P-value	0.0403	0.0001	0.0414	0.0007	0.0003	0.0028	0.1955	0.1955	0.0084	0.1955	0.0046	0.0015	0.0002
Rank		14	37	20	18	27			32		29	26	17

Appendix J: Graduate Evaluation Supervisor Responses (continued)

	Question												
Response	41	42	43	44	45	46	47	48	49	50	51	52	53
1	0	0	0	1	0	0	0	0	0	0	0	0	0
2	1	1	0	0	0	1	0	0	0	0	0	0	0
3	23	23	13	5	23	22	4	1	1	2	1	1	4
4	8	8	4	1	10	10	1	2	0	1	1	1	4
Count	32	32	17	7	33	33	5	3	1	3	2	2	8
Mode	3	3	3	3	3	3	3	4	3	3	4	4	4
Mean	3.2188	3.2188	3.2353	2.8571	3.3030	3.2727	3.2000	3.6667	3.0000	3.3333	3.5000	3.5000	3.5000
Std Dev	0.4908	0.4908	0.4372	0.8997	0.4667	0.5168	0.4472	0.5774	N/A	0.5774	0.7071	0.7071	0.5345
t-calc	2.5210	2.5210	2.2188	-0.4201	3.7300	3.0317	1.0000	2.0000	N/A	1.0000	1.0000	1.0000	2.6458
t-test	0.9915	0.9915	0.9793	N/A	0.9996	0.9976	0.8130	0.9082	N/A	0.7887	0.7500	0.7500	0.9834
95%	Yes	Yes	Yes	N/A	Yes	Yes	No	No	N/A	No	No	No	Yes
99%	Yes	Yes	No	N/A	Yes	Yes	No	No	N/A	No	No	No	No
P-value	0.0085	0.0085	0.0207	N/A	0.0004	0.0024	0.1870	0.0918	N/A	0.2113	0.2500	0.2500	0.0166
Rank	33	33	29		21	24							

Appendix J: Graduate Evaluation Supervisor Responses (continued)

Response	Question 54	55	56	57	58	59	60
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	3	3	4	4	6	4	4
4	5	5	5	5	3	4	5
Count	8	8	9	9	9	8	9
Mode	4	4	4	4	3	4	4
Mean	3.6250	3.6250	3.5556	3.5556	3.3333	3.5000	3.5556
Std Dev	0.5175	0.5175	0.5270	0.5270	0.5000	0.5345	0.5270
t-calc	3.4157	3.4157	3.1623	3.1623	2.0000	2.6458	3.1623
t-test	0.9944	0.9944	0.9933	0.9933	0.9597	0.9834	0.9933
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	Yes	Yes	No	No	Yes
P-value	0.0056	0.0056	0.0067	0.0067	0.0403	0.0166	0.0067
Rank							

Appendix K: Graduate Evaluation Graduate Responses

		Question											
Totals	**Response**	1	2	3	4	5	6	7	8	9	10	11	12
0	**1**	0	0	0	0	0	0	0	0	0	0	0	0
13	**2**	0	0	0	0	0	0	1	0	0	0	0	0
556	**3**	10	10	11	9	9	11	10	9	13	8	14	11
1126	**4**	29	25	28	27	27	26	26	30	24	30	24	27
	Count	39	35	39	36	36	37	37	39	37	38	38	38
	Mode	4	4	4	4	4	4	4	4	4	4	4	4
	Mean	3.7436	3.7143	3.7179	3.7500	3.7500	3.7027	3.6757	3.7692	3.6486	3.7895	3.6316	3.7105
	Std Dev	0.4424	0.4583	0.4559	0.4392	0.4392	0.4634	0.5299	0.4268	0.4840	0.4132	0.4889	0.4596
	t-calc	10.4976	9.2195	9.8350	10.2470	10.2470	9.2245	7.7563	11.2546	8.1524	11.7792	7.9642	9.5299
	t-test	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Rank	9	11	10	7	7	14	18	5	25	2	29	13

Appendix K: Graduate Evaluation Graduate Responses (continued)

Response	Question 13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
3	14	16	10	12	8	6	8	11	12	11	13	8	8	13
4	19	13	25	26	16	18	14	20	24	16	22	28	28	16
Count	33	31	35	38	24	24	22	31	36	27	35	36	36	29
Mode	4	3	4	4	4	4	4	4	4	4	4	4	4	4
Mean	3.5758	3.3548	3.7143	3.6842	3.6667	3.7500	3.6364	3.6452	3.6667	3.5926	3.6286	3.7778	3.7778	3.5517
Std Dev	0.5019	0.6082	0.4583	0.4711	0.4815	0.4423	0.4924	0.4864	0.4781	0.5007	0.4902	0.4216	0.4216	0.5061
t-calc	6.5900	3.2484	9.2195	8.9536	6.7823	8.3066	6.0622	7.3855	8.3666	6.1496	7.5854	11.0680	11.0680	5.8704
t-test	1.0000	0.9986	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value	0.0000	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rank	35	38	11	16				28	22	34	30	3	3	36

Appendix K: Graduate Evaluation Graduate Responses (continued)

	Question												
Response	27	28	29	30	31	32	33	34	35	36	37	38	39
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	1	0	0	0	1	0	1	0
3	11	12	7	12	8	10	17	9	10	13	10	12	13
4	23	13	29	22	26	23	19	12	10	23	11	24	21
Count	34	25	36	34	34	34	36	21	20	37	21	37	34
Mode	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean	3.6765	3.5200	3.8056	3.6471	3.7647	3.6471	3.5278	3.5714	3.5000	3.5946	3.5238	3.6216	3.6176
Std Dev	0.4749	0.5099	0.4014	0.4851	0.4306	0.5440	0.5063	0.5071	0.5130	0.5507	0.5118	0.5452	0.4933
t-calc	8.3066	5.0990	12.0416	7.7782	10.3562	6.9360	6.2544	5.1640	4.3589	6.5672	4.6904	6.9348	7.3012
t-test	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	1.0000	0.9999	1.0000	1.0000
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001	0.0000	0.0000
Rank	17		1	26	6	26	37			33		31	32

Appendix K: Graduate Evaluation Graduate Responses (continued)

Response	Question 40	41	42	43	44	45	46	47	48	49	50
1	0	0	0	0	0	0	0	0	0	0	0
2	0	1	2	1	0	0	1	0	0	0	0
3	12	10	7	7	9	12	10	7	2	4	6
4	25	25	28	18	10	25	26	14	8	7	7
Count	37	36	37	26	19	37	37	21	10	11	13
Mode	4	4	4	4	4	4	4	4	4	4	4
Mean	3.6757	3.6667	3.7027	3.6538	3.5263	3.6757	3.6757	3.6667	3.8000	3.6364	3.5385
Std Dev	0.4746	0.5345	0.5708	0.5616	0.5130	0.4746	0.5299	0.4830	0.4216	0.5045	0.5189
t-calc	8.6603	7.4833	7.4882	5.9367	4.4721	8.6603	7.7563	6.3246	6.0000	4.1833	3.7417
t-test	1.0000	1.0000	1.0000	1.0000	0.9999	1.0000	1.0000	1.0000	0.9999	0.9991	0.9986
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0009	0.0014
Rank	18	22	14	24		18	18				

Appendix K: Graduate Evaluation Graduate Responses (continued)

Response	Question 51	52	53	54	55	56	57	58	59	60
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	1	1
3	4	4	4	5	5	5	7	5	7	5
4	9	10	8	6	6	7	5	7	5	6
Count	13	14	12	11	11	12	12	12	13	12
Mode	4	4	4	4	4	4	3	4	3	4
Mean	3.6923	3.7143	3.6667	3.5455	3.5455	3.5833	3.4167	3.5833	3.3077	3.4167
Std Dev	0.4804	0.4688	0.4924	0.5222	0.5222	0.5149	0.5149	0.5149	0.6304	0.6686
t-calc	5.1962	5.7009	4.6904	3.4641	3.4641	3.9243	2.8031	3.9243	1.7598	2.1589
t-test	0.9999	1.0000	0.9997	0.9970	0.9970	0.9988	0.9914	0.9988	0.9481	0.9731
95%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
99%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
P-value	0.0001	0.0000	0.0003	0.0030	0.0030	0.0012	0.0086	0.0012	0.0519	0.0269
Rank										

Appendix L: Survey Comparisons

TASK	Lude P-Value	Lude Rank	Sweeney P-Value	Sweeney Rank	Grad/Eval Supervisors Mean	Grad/Eval Supervisors Rank	Grad/Eval Graduates Mean	Grad/Eval Graduates Rank
Preparation for Flight								
Mission Planning					3.35	15	**3.74**	**9**
Fuel Planning	0.0011	24	0.0414	26				
Flight Planning	< 0.0003	19	0.0209	20				
Flight Log/DD175 Prep					3.38	11	3.71	11
Ground Operations					3.37	13	**3.72**	**10**
Preflight	< 0.0003	11	**0.0010**	**8**				
Taxi			0.0102	15				
Flight Phase								
Takeoff Proc	0.0006	23	**0.0010**	**8**	**3.44**	**3**	**3.75**	**7**
Departure					**3.38**	**8**	**3.75**	**7**
SID	< 0.0003	21	**0.0010**	**8**				
Autopilot Operation	**< 0.0003**	**3**	**0.0004**	**5**	3.10	38	3.58	35
Radar Ops/Wx Avoid	**< 0.0003**	**4**	**0.0010**	**8**	3.19	36	3.35	38
FSAS/INS Procedures	**< 0.0003**	**2**	**0.0000**	**1**				
Basic Aircraft Control	< 0.0003	12	**0.0008**	**7**	3.35	15	3.70	14
Climb/Cruise/Descent			0.0934	33				
A/R and Rendezvous	**< 0.0003**	**9**						
Holding	< 0.0003	13	0.0282	23	3.28	23	3.67	22
Penetration					3.25	28	3.59	34
Enroute Descent					3.21	35	3.63	30
Precision App	**< 0.0003**	**5**	0.0149	18				
ILS					**3.42**	**4**	**3.78**	**3**
CAT II ILS	0.0189	33	0.0814	32				
PAR					3.38	12	3.55	36
Non-Precision App	< 0.0003	14	0.0018	13				
ASR					**3.39**	**7**	3.68	17
LOC					3.36	14	**3.81**	**1**
BC LOC					3.15	37	3.65	26
VOR/TAC					3.32	20	**3.76**	**6**
NDB					3.32	18	3.65	26
Circling					3.26	27	3.53	37

TASK	Lude P-Value	Lude Rank	Sweeney P-Value	Sweeney Rank	Grad/Eval Supervisors Mean	Grad/Eval Supervisors Rank	Grad/Eval Graduates Mean	Grad/Eval Graduates Rank
Flight Phase (cont)								
Low Altitude App					**3.42**	**4**	**3.78**	**3**
ICAO Procedures	0.0043	29						
VFR Pattern/App	0.0643	34	0.0414	28	3.34	17	**3.68**	**18**
Missed App/Go-Around	0.0005	22	0.0076	14				
Missed App					3.23	32	3.59	33
Go-Around					3.27	24	3.68	18
Normal Landing	< 0.0003	**10**	0.0518	29	3.24	29	3.62	31
Cross Wind Landing	< 0.0003	**8**						
Night Operations	0.0013	25						
Inflight planning					**3.38**	**8**	3.68	16
Fix to fix					3.30	22	3.66	28
Visual straight-in					3.27	26	3.62	32
Full flap pattern and land					3.22	33	3.67	22
Partial flap pattern/land					3.22	33	3.70	14
Touch and go					3.30	21	3.68	18
Emergency Proc (EP)					3.27	24	3.63	29
EP Checklist Proc	< 0.0003	18	0.0932	34				
Assymmetric Thrust	**< 0.0003**	**7**	0.0105	16	3.14		3.5700	
Gear Malfunction			0.0414	26				
Boldface	0.0025	28	0.0932	34				
General								
Aircraft Systems	< 0.0003	20	0.0518	29				
Com/Nav Equipment			0.0149	18				
Instrumentation			0.0518	31				
FSAS/INS Knowledge			**0.0000**	**2**				
Checklist Proc	< 0.0003	**6**	0.0004	**5**	**3.46**	**2**	**3.77**	**5**
Radio Communications	< 0.0003	16	0.0010	**8**	3.32	18	3.65	25
Crew Coordination	**< 0.0003**	**1**	**0.0001**	**3**	**3.49**	**1**	**3.79**	**2**
Situational Awareness	< 0.0003	15						
Safety Awareness			0.0210	22				
Clearing					3.24	29	3.68	18
Judgement	< 0.0003	17	0.0282	23				
Co-pilot duties					**3.39**	**6**	3.71	11
Knowledge of Directives								
Performance Concepts	0.0023	27	0.0282	23				
Dash One Usage	0.0102	31	0.0209	20				
AFM 51-37	0.0020	26	**0.0001**	**3**	**3.38**	**8**	3.71	13
AFI 11-206	0.0102	31	0.0105	16	**3.38**	**8**	3.71	13

Appendix M: Graduate Evaluation Questionnaire

SPECIALIZED UNDERGRADUATE FLYING TRAINING/FIXED-WING TRANSITION
Graduate Evaluation — *Supervisor Questionnaire*
Pilot Course P-V4A-G-3/F-V5A-Q

Thank you for taking the time to complete this survey to improve our training operation.

Student Name/Rank:	***SUPT/FWT Class#/Base:***
Gaining Aircraft:	***CCTS Base:***

"This SUPT/FWT student's preparation level to start CCTS training in the following tasks was:"

Not Performed	Unacceptable *(Mandatory comment)*	Marginal *(Mandatory comment)*	Satisfactory	Excellent
N	U	M	S	E

	Common Tasks					
1	Mission Planning	N	U	M	S	E
2	Flight Log/DD 175 Prep	N	U	M	S	E
3	Ground Operations	N	U	M	S	E
4	Takeoff	N	U	M	S	E
5	Departure	N	U	M	S	E
6	Basic Aircraft Control	N	U	M	S	E
7	Clearing	N	U	M	S	E
8	Checklist Procedures	N	U	M	S	E
9	Radio Procedures	N	U	M	S	E
10	Crew Resource Management	N	U	M	S	E
11	Emergency Procedures	N	U	M	S	E
12	AFM 51-37 / AFR 60-16 Knowledge	N	U	M	S	E
13	Autopilot Operation	N	U	M	S	E
14	Radar Operation	N	U	M	S	E
15	Copilot Duties	N	U	M	S	E
16	Inflight Planning	N	U	M	S	E
	Instrument Maneuvers					
17	Steep Turns	N	U	M	S	E
18	Unusual Attitudes	N	U	M	S	E
19	Vertical S	N	U	M	S	E
20	Fix To Fix	N	U	M	S	E
21	Holding	N	U	M	S	E
22	Penetration	N	U	M	S	E
23	Enroute Descent	N	U	M	S	E
24	Low Altitude Approach	N	U	M	S	E
25	ILS Approach	N	U	M	S	E
26	PAR Approach	N	U	M	S	E
27	ASR Approach	N	U	M	S	E
28	No-Gyro Approach	N	U	M	S	E
29	Localizer Approach	N	U	M	S	E
30	Localizer Back Course Approach	N	U	M	S	E
31	VOR/TAC Approach	N	U	M	S	E
32	NDB Approach	N	U	M	S	E
33	Circling Approach	N	U	M	S	E
34	Engine-Out Precision Approach	N	U	M	S	E
35	Engine-Out Non-Precision Approach	N	U	M	S	E
36	Missed Approach	N	U	M	S	E
37	Engine-Out Missed Approach	N	U	M	S	E
	Visual Maneuvers					
38	Transition To Landing/Landing	N	U	M	S	E
39	Visual Straight-In	N	U	M	S	E
40	Rectangular / Closed Pattern	N	U	M	S	E
41	Full Flap Pattern/Landing	N	U	M	S	E
42	Partial Flap Pattern/Landing	N	U	M	S	E
43	No Flap Pattern/Landing	N	U	M	S	E
44	Engine-Out Pattern/Landing	N	U	M	S	E
45	Touch And Go Procedures	N	U	M	S	E
46	Go-Around	N	U	M	S	E
47	Engine-Out Go-Around	N	U	M	S	E
	Air Refueling Procedures					
48	A/R Tanker Procedures	N	U	M	S	E
49	A/R Receiver Procedures	N	U	M	S	E
50	Overrun	N	U	M	S	E

51 Precontact	N U M S E
52 Breakaway	N U M S E
Formation and/or Airdrop Procedures(C-130 Phase II only)	
53 Interval Takeoff – Wing	N U M S E
54 Cell Formation – Wing	N U M S E
55 Cell Formation – Lead	N U M S E
56 Formation Departure	N U M S E
57 Enroute Procedures	N U M S E
58 Wingman Consideration	N U M S E
59 Route Entry	N U M S E
60 Map Reading	N U M S E
61 VFR Ground Track Control	N U M S E
62 Inflight Computations	N U M S E
63 Position Change	N U M S E
64 Lost Wingman	N U M S E
65 Formation Breakout	N U M S E
66 Airdrop – Lead	N U M S E
67 Airdrop – Wing	N U M S E
68 VFR Arrival Procedures	N U M S E

UNIVERSAL ASSESSMENT

Training program did not adequately prepare graduate to *start* follow-on training *(Mandatory comment below)*	Training program adequately prepared graduate to *start* follow-on training
0	1

69 **Skill and Knowledge** — Did the graduate have the appropriate skills and knowledge to enter the next phase of follow-on training? 0 1

70 **Attitude** — Did the graduate display the appropriate attitude demonstrating the desire to perform the tasks required to accomplish the training program? 0 1

71 **Airmanship** — Did the graduate display the required flight discipline, situational awareness and judgment to safely accomplish an assigned mission? 0 1

72 **Military Professionalism** — Did the graduate project the image expected of a professional military officer? 0 1

73 **Mission Readiness** — Was the graduate adequately prepared to accomplish the *training mission* with confidence? 0 1

74 **Customer Satisfaction** — Are you, the customer, satisfied with the quality of the graduate? 0 1

COMMENTS *(Mandatory for items marked U, M, or 0)*

Item #	*Comments (Use additional paper if necessary)*

Please return to:
47 OG/QI, 150 Freedom Way, Laughlin AFB TX 78843-5235

Appendix N: Sweeney Questionnaire

FlightSafety
SERVICES CORPORATION

P.O. Box 8040, Altus, OK 73522 (405) 482-9223 FAX: (405) 482-9389

PILOT INSTRUCTOR FEEDBACK QUESTIONNAIRE
SPECIALIZED UNDERGRADUATE PILOT TRAINING (SUPT)

TO: ____________________________ DATE: ________________

Your student, __________________________, Class __________, attended Specialized Undergraduate Pilot Training (SUPT) and was trained in the T-1 instead of the T-38. We would appreciate your assistance in making an assessment of the impacts of this training on our Initial Qualification (AB) Course.

Please fill out the following questionnaire for each SUPT student you have instructed at the end of the course. Return the completed questionnaire to the Evaluation Office. Your general comments on the overall quality of these "new" pilots we are training and your assessment of possible impacts on the AB Course will help build our Initial Qual Course for the future. Eventually, all UPT graduates coming to the C-5 will be trained in the T-1.

If you have any questions, comments or suggestions, please see me or Dave Gates.

Thank you for your cooperation.

Sincerely,

James V. Sweeney
Manager, Summative Evaluation

+ = T-1 Students performed better than a T-38 UPT graduate.
0 = T-1 Students performed the same as a T-38 UPT graduate.
- = T-1 Students performed worse than a T-38 UPT graduate.

If you leave the task blank, I'll assume it is an area that does not apply to your training

JOB ELEMENTS	RATINGS			COMMENTS
Preparation for Flight	+	0	-	
1. Fuel Planning	( )	( )	( )	________
2. Flight Planning	( )	( )	( )	________
3. Preflight	( )	( )	( )	________
Flight Phase				
4. Takeoff Procedures	( )	( )	( )	________
5. SID	( )	( )	( )	________
6. Autopilot Operation	( )	( )	( )	________
7. Radar Operation/WX Avoidance	( )	( )	( )	________
8. FSAS/INS Procedures	( )	( )	( )	________
9. Basic Aircraft Control	( )	( )	( )	________
10. Air Refueling/Rendezvous Proc.	( )	( )	( )	________
11. Holding	( )	( )	( )	________
12. Precision Approach	( )	( )	( )	________
13. Non-Precision Approach	( )	( )	( )	________
14. ICAO Procedures	( )	( )	( )	________
15. CAT II ILS	( )	( )	( )	________
16. VFR Pattern/Approach	( )	( )	( )	________
17. Missed Approach/Go Around	( )	( )	( )	________
18. Landing	( )	( )	( )	________
19. Night Flying	( )	( )	( )	________
Emergency Procedures				
20. Emergency Checklist Procedures	( )	( )	( )	________
21. Assymetric Thrust Procedures	( )	( )	( )	________

JOB ELEMENTS	RATINGS			COMMENTS
General	+	0	-	
22. Aircraft Systems	( )	( )	( )	______
23. Checklist Procedures	( )	( )	( )	______
24. Radio Communication	( )	( )	( )	______
25. Crew Coordination	( )	( )	( )	______
26. Situational Awareness	( )	( )	( )	______
27. Judgement	( )	( )	( )	______
28. Anti-Hijack Procedures	( )	( )	( )	______
Knowledge of Directives				
29. Performance Data Concepts	( )	( )	( )	______
30. Dash One Usage	( )	( )	( )	______
31. AFM 51-37	( )	( )	( )	______
32. AFI 11-206	( )	( )	( )	______
33. GP	( )	( )	( )	______
Other Tasks - Please Specify:				
34. ______	( )	( )	( )	______
35. ______	( )	( )	( )	______
36. ______	( )	( )	( )	______

Do you think SUPT (T-1) graduates can complete the Initial Qualification Course with:

less academic class time?	Y	N
fewer CPT/WST missions?	Y	N
fewer aircraft sorties?	Y	N
reduced aircraft events?	Y	N

COMMENTS

______

______

______

______

______

Appendix O: Lude Questionnaire

30 June 1996

MEMORANDUM FOR SURVEY PARTICIPANTS

FROM: 97 Ops Group/CD

SUBJECT: SUPT Graduate Eval Survey

1. Background: The USAF procurement of the T-1A marked the beginning of a new dual track Undergraduate Pilot Training system. Currently, the T-1A program is in full operation at Reese AFB, Laughlin AFB, and most recently Vance AFB. Columbus AFB will transition to the T-1A next year.

   Purpose: AETC has been undergoing historical changes. The survey is intended to capture some of the history and changes in progress. Over the last few years, Altus AFB has received UPT graduates from the T-38 as well as SUPT graduates from the T-1A. Your comments on the overall quality of these "new" pilots and your assessment of possible impacts on the Initial Qualification Course will help steer future training. Very soon, all UPT graduates coming to Altus will be trained in the T-1.

2. Confidentiality: You have been carefully selected to represent the opinions of many others like you. Your participation is essential for clearly representing the aggregate view. Participation in this survey is voluntary and completely anonymous.

3. Questions: Please address questions to Capt Carl Lude, email: ludec.awc@mcguire.af.mil or DSN: 944-4401. I solicit your prompt cooperation in this project and thank you for your time.

Leo A. Brownyard

LEO A. BROWNYARD, Colonel, USAF
Deputy Commander, 97th Operations Group

Attachment:
SUPT Graduate Eval Survey

Aircraft Type ________________

Years as instructor at Altus ____________

Directions: Please consider only initial qualification students as you fill out this survey. Do not include banked requal pilots in your assessment.

Rating Scale: Use the following scale to rate your opinion of the average T-1A SUPT graduate as compared to an average T-38 UPT graduate.

Significantly Worse	Worse	About the Same	Better	Significantly Better
1	2	3	4	5

If you leave the task blank, I'll assume it is an area that does not apply to your training.

Example:

Preparation for Flight	1	2	3	4	5
1 Fuel Planning			X		

This answer indicates that you believe the average T-1A SUPT graduate performs about the same as the average T-38 UPT graduate.

Questions 38 - 43 are yes/no questions. Please answer all of these questions.

There is room at the end of the survey for additional comments. Please use this space to communicate your experiences and opinions of the SUPT program.

Return the completed questionnaire to Capt Garland (#7954) or Capt Lude.

Preparation for Flight	1	2	3	4	5
1 Fuel Planning					
2 Flight Planning					
3 Preflight					

Flight Phase	1	2	3	4	5
4 Takeoff Procedures					
5 SID ~~K~~nowledge and execution					
6 Autopilot Operation					
7 Radar operation - Weather Avoidance					
8 Use and understanding of FSAS/INS					
9 Basic Aircraft Control					
10 Air Refueling/Rendezvous Procedures					
11 Holding					
12 Precision Approach					
13 Non-Precision Approach					
14 ICAO Procedures					
15 CAT II ILS					
16 VFR Pattern/Approach					
17 Missed Approach/Go Around					
18 Normal Landing					
19 Cross Wind Landing Procedures					
20 Night Operations					

Emergency Procedures	1	2	3	4	5
21 Emergency Checklist Procedures					
22 Asymmetric Thrust Procedures					
23 Boldface Procedures					
General	**1**	**2**	**3**	**4**	**5**
24 Aircraft Systems					
25 Checklist Procedures					
26 Radio Communications					
27 Crew Coordination					
28 Situational Awareness					
29 Judgment					
Knowledge of Directives	**1**	**2**	**3**	**4**	**5**
30 Performance Data Concepts					
31 Dash One Usage					
32 AFM 51-37					
33 AFI 11-206					
34 General Planning (GP)					
Other Tasks - Please Specify	**1**	**2**	**3**	**4**	**5**
35					
36					
37					

Please answer each of the following questions. Circle the appropriate answer.

Do you think SUPT graduates can complete the Initial Qualification Course with:

38. less academic class time? Yes No
39. fewer CPT/SIM missions? Yes No
40. fewer aircraft sorties? Yes No
41. reduced aircraft events? Yes No

42. Have you noted any consistent weaknesses in T-38 UPT graduates? Yes No

If Yes, please explain:

43. Have you noted any consistent weaknesses in T-1A SUPT graduates? Yes No

If Yes, please explain:

Additional Comments

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Vita

Major Carl A. Lude was born on 6 April 1961 in Truckee, California. He graduated from Eureka High School in 1979 and received his Bachelor of Science degree in civil engineering in 1985 from the University of the Pacific. He was a Distinguished Graduate from the USAF Officer Training School at Lackland AFB, Texas where he received his regular commission on 29 October 1985.

As a Second Lieutenant, he received the Flying Training Award from Undergraduate Pilot Training at Reese AFB Texas and became one of the initial Second Lieutenants selected to the KC-10. He was a Distinguished Graduate from Squadron Officer's School, Maxwell AFB, in 1990 before becoming the 9th Air Refueling Squadron's (KC-10) Assistant Chief of the Combat Crew Training School. He was then selected as an Initial Cadre T-1A Pilot Instructor at Laughlin AFB where he became the check flight and standardization/evaluation flight commander. While at Laughlin AFB, he completed a Master of Aeronautical Science through the extended campus of Embry-Riddle Aeronautical University. In August 1995, he entered the School of Logistics and Acquisition Management, Air Force Institute of Technology as part of the Advanced Study of Air Mobility (ASAM) program.

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13. ABSTRACT (*Maximum 200 Words*)

Air Education and Training Command's acquisition of the T-1A marked the return to specialized undergraduate pilot training (SUPT), once used prior to 1959. Currently, three pilot training bases have completed the transition to the SUPT. All studies leading to SUPT cited cost and improved training quality as major factors in the decision to implement the SUPT concept. While cost figures can be analyzed at any time, the opportunity to evaluate differences between undergraduate pilot training (UPT) and SUPT based on instructor pilot expertise and experience is limited. This study examines the training quality improvements of SUPT as compared to UPT. It begins with an analysis of the two different training syllabi. It then examines two additional questionnaires to develop a unique survey targeted at drawing expert opinions about the differences in training quality of SUPT and UPT graduates. The results of this study verify the projected quality improvements of earlier studies and can be used as a benchmark for future improvements to the SUPT program. Future improvements include evaluating follow-on training and modifying this training to enhance both cost and training benefits of the new SUPT system. This study can provide the foundation necessary to target these future changes.

14. SUBJECT TERMS Specialized Undergraduate Pilot Training, T-1A, SUPT, Pilot training, Undergraduate Pilot Training			15. NUMBER OF PAGES 104
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298-102

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AFIT RESEARCH ASSESSMENT

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT research. **Please return completed questionnaire** to: AFIT/LAC BLDG 641, 2950 P STREET, WRIGHT-PATTERSON AFB OH 45433-7765 or e-mail to dvaughan@afit.af.mil or nwiviott@afit.af.mil. Your response is **important.** Thank you.

1. Did this research contribute to a current research project? a. Yes b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?
a. Yes b. No

3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

Man Years___________ $___________

4. Whether or not you were able to establish an equivalent value for this research (in Question 3), what is your estimate of its significance?

a. Highly Significant b. Significant c. Slightly Significant d. Of No Significance

5. Comments (Please feel free to use a separate sheet for more detailed answers and include it with this form):

Name and Grade

Organization

Position or Title

Address